# BANGALORE WATER SUPPLY AND SEWERAGE BOARD

CAUVERY BHAVAN, KEMPEGOWDA ROAD,
BANGALORE – 560 009

## Tender for the Work of Providing Asphalt on BWSSB Pipeline Road from Arkavathi Bridge of Kanakapura Taluk to Agrahara Village coming under AEE(K-O&M)-2-1 Harohalli

**Office of the *Chief Engineer (Kaveri- O&M)***

**BANGALORE WATER SUPPLY AND SEWERAGE BOARD (BWSSB)**

*6th Floor, Cauvery Bhavan,*
*K.G.Road,*
*Bangalore -560009.*

Telephone – 080-22945263
Website **www.kppp.karnataka.gov.in**

| | | | |
|---|---|---|---|
| TENDER REFERENCE : | : | Tender for the Work of Providing Asphalt on BWSSB Pipeline Road from Arkavathi Bridge of Kanakapura Taluk to Agrahara Village coming under AEE(K-O&M)-2-1 Harohalli BWSSB/CEK(O&M)TE/TA-01/17/2024/410 / 2025-26 Dated:10/07/2025 | |
| PERIOD OF Download OF TENDER DOCUMENT | : | From: 14/07/2025 | To: 28/07/2025 |
| LAST DATE AND TIME FOR Submission / Uploading OF TENDERS | : | 28/07/2025 up to15:00hrs | |
| TIME AND DATE OF OPENING OF TECHNICAL TENDERS | : | 29/07/2025 at 16:00hrs | |
| DATE OF PRE_BID MEETING | | 22/07/2025 at 15:00hrs | |
| PLACE OF OPENING OF TECHINCAL TENDERS | : | Office of the Chief Engineer (Kaveri-Operation & Maintenance),<br>Bangalore Water supply and Sewerage Board,<br>6th Floor, Kaveri Bhavan, Kempegowda Road,<br>Bangalore-560 009 | |
| TIME AND DATE OF OPENING OF PRICE TENDERS | : | 30/07/2025 at 16.00hr | |
| ADDRESS FOR COMMUNICATION | : | Office of the Chief Engineer (Kaveri-Operation & Maintenance),<br>Bangalore Water supply and Sewerage Board,<br>6th Floor, Kaveri Bhavan, Kempegowda Road,<br>Bangalore-560 009 | |

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# BANGALORE WATER SUPPLY AND SEWERAGE BOARD

**Office of TheChief Engineer - (**Kaveri-Operation & Maintenance**),**
6thFloor, Cauvery Bhavan DBlock,K.G.Road, Bangalore 560009
Website **www.kppp.karnataka.gov.in**
Telephone: 080- 22945263

## SECTION 1:

INVITATION FOR TENDER (IFT)

**(Through Karnataka public Procurement Portal Only)**

**IFT No.:** BWSSB/CEK(O&M)TE/TA-01/120/2024/410 /2025-26
Dated:10/07/2025

1. The Chief Engineer (Kaveri-O&M) invites tenders from eligible tenderers, for the construction of works detailed in the Table below. The tenderers may submit tenders for any or all of the works given in the Table. Two Cover Tender procedure as per Rule28 of the KTPP Act shall be followed. The Tenders are required to submit two separate sealed covers, one containing the Earnest money deposit and the details of their capability to undertake the tender (as detailed in ITT Clause 3and 6), which will be opened first and the second cover containing the price tender which will be opened only if the Tenderer is found to be qualified to execute the tendered works. The Tenderers are advised to note the minimum qualification criteria specified in Clause 3 of the Instructions to Tenderers to qualify for award of the contract

2. Tender documents may be purchased by clicking on e-procurement wizard which will link to www.kppp.karnataka.gov.in from 14/07/2025 to 28/07/2025 **,** for a non-refundable fee as indicated in the Table below, in the form of OTC,NEFT, DEBIT CARD and CREDIT CARD through e-portal only**.** Interested tenderers may obtain further information at the same address. Tender documents may be requested by mail by making payment towards the tender document in any of the method said earlier. Tenderers will be issued a password and authorized for accessing the tender document in the website with URL: **www.kppp.karnataka.gov.in**

3. The Bidder can download the e-tender document using his user ID –password, by accessing Karnataka Govt and by clicking on e-procurement wizard which will link to **www.kppp.karnataka.gov.in** where electronic tender form is provided. Additional information related to e-tender process can be obtained through the above mentioned website. The electronic tender comprising Technical and Financial bids will be operated as Two stage Tender system.
4. Tenders must be accompanied by Earnest Money Deposit specified for the work in the Table below. Earnest Money Deposit will have to be in any one of the forms as specified in the Tender document and shall have to be valid for 45 days beyond the validity of the tender.

| Sl. No | Name of Work | Cost of Tender Document including Taxes Rs. | Amount put to Tender excluding GST Rs. in Lakhs (Approx) | Bid Security Rs. in Lakhs | Period of completion | Eligibility Criteria during last 5 years (2020-21 , 2021-22,2022-23, 2023-24 & 2024-25) | |
|---|---|---|---|---|---|---|---|
| | | | | | | Turnover (in all classes of Civil Engineering construction works ) for any of the two years Rs. in Lakhs | Performance & Work Qualification |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 1 | Tender for the Work of Providing Asphalt on BWSSB Pipeline Road from Arkavathi Bridge of Kanakapura Taluk to Agrahara Village coming under AEE(K-O&M)-2-1 Harohalli | To be specified by e-procurement cell. | **138.31 lakhs (Excluding GST)** | **2.07 lakhs** | 12 months (Including monsoon period) | **326.42 lakhs** | i) As prime contractor Should have satisfactorily completed<br><br>i) at least one Similar Contract such as work of Providing Asphalt Road of value not less than Rs**. 81.6 lakhs**.<br><br>ii) executed in any one year, the following minimum quantities of work<br><br>a) Construction of Granular Sub base– 280 **m3**<br>b) **Bituminous macadum -576 m3**<br>**c)**Bituminous Concrete- - **384m3** |

Amount put to tender is excluding GST, So bidders shall quote item rates excluding GST only.

5. The last date for uploading of completed tender document is **on 28 /07 /2025** upto **15:00 hrs.** The bids will be opened on 29/11/2024 at **16:00 hrs** in the presence of bidders or their authorized representatives. If the bid opening day remains as public holiday, Bids will be opened on the next working day at the original stipulated time

6. EMD can be paid through OTC,NEFT, DEBIT CARD and CREDIT CARD through e-portal only. The value of the Bid Security / EMD is as mentioned in the table above in column no 4.

7. Bidders can access tender documents from the website and upload the required details; those are mentioned in different sections in the bid document in to electronic tender box on the website. Scanned documents those are required to be furnished as per Section 2, 3 &4 of the bid document shall be submitted through e-portal only in **PDF** format for clear vision. The EMD to be paid through OTC,NEFT, DEBIT CARD and CREDIT CARD through e-portal only on or before 28/07/2025 upto **15:00 hrs.**

8. The cost of the tender document once paid will not be refunded.

9. The successful bidder would be required to give performance **bank guarantee of 5%** of the contract amount plus additional security for unbalanced bid amount from a Nationalized / Scheduled Indian Bank, with jurisdiction at Bangalore as specified, towards guarantee for completion of work within the stipulated period.

10. Applications / requisitions from joint venture Firms are not acceptable.

11. Bangalore Water Supply and Sewerage Board reserve the right to cancel or annul the entire or part of this process of invitation at any time without assigning any reason.

12. For any additional information regarding the above tender, the firms who are interested to quote, may contact office of the undersigned at the office address given below on all working days during office hours 10:30hours to 17:00 hours.

**The Chief Engineer (*Kaveri-Operation & Maintenance*),**
Bangalore Water Supply and Sewerage Board
6th Floor, Cauvery Bhavan D- Block,
Kempe Gowda Road, Bangalore - 560009
Karnataka, India.
Telephone: +91-80- 22945263
Or **visit Website www.kppp.karnataka.gov.in**

13. List of documents to support qualification of bidder is to be uploaded to the e-Portal website **www.kppp.karnataka.gov.in**

14. Bidders shall submit offers that comply with the requirements of the bid document, including the basic technical design as indicated in the drawing and specifications. Alternatives will not be considered. The attention of the bidders is drawn to clause 23 regarding the rejection of the bids, which are not substantially responsive to the requirement of the bid document.

15. Other details can be seen in the tender documents.

Sd/-
Chief Engineer(***Kaveri-Operation & Maintenance***)
BWSSB.

# SECTION 2:

# INSTRUCTIONS TO TENDERERS (ITT)

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## A. General

### 1. Scope of Tender

1.1 The ***Chief Engineer (K-O&M),*** (Referred to as Employer in these documents) invites tenders following Two Cover e-Procurement procedure, from eligible Tenderers, for the construction of work (as defined in these documents and referred to as "the work") detailed in the Table given in the Invitation for Tenders (IFT).

### 2. Eligible Tenderers

2.1 Tenderers shall not be under a declaration of ineligibility for corrupt and fraudulent practices issued by the Government of Karnataka

2.2 Tenders from Joint ventures are not acceptable.

### 3. Qualification of the Tenderer:

1 3.1 All Tenderers shall provide the requested information accurately and in sufficient detail in Section 3: Qualification information.

1 3.2 To qualify for award of this Contract, each Tenderer in its name should have in the last five years i.e. 2020-21 to 2024-25

**i.** To qualify for award of this contract, Should have achieved in at least two financial years a minimum financial turnover (in all classes of civil engineering construction works only) of **Rs.326.42lakhs.**

**ii.** As prime contractor, should have satisfactorily completed at least **one** Similar Contract such as work of providing Asphalt Road of value not less than **Rs.81.6 Lakhs**

iii. Executed in any one year, the following minimum quantities of work:

a) Construction of Granular Sub base– 280 m3
b) Bituminous macadam -576 m3
c)Bituminous Concrete- - 384m3

3.3 Each Tenderer should further demonstrate: Not Applicable

3.4 Liquid assets or availability of credit facilities of not less than **Rs. 40.81 Lakhs**

(Credit lines/ letter of credit/ certificates from Nationalized/schedule banks in India
for meeting the fund requirement etc

3.5 To qualify for a package of contracts made up of this and other contracts for which
tenders are invited in this IFT, the Tenderer must demonstrate having experience and
resources to meet the aggregate of the qualifying criteria for the individual contracts.

3.6 Sub-contractors experience and resources shall not be taken into account in determining the Tenderers compliance with the qualifying criteria.

1 3.7 Tenderers who meet the above specified minimum qualifying criteria, will only be qualified, if their available tender capacity is more than the total tender value( > 163.21 lakhs). The available tender capacity will be calculated as under

**Assessed available tender capacity = (A*N*1.5 - B)**

Where,

A = Maximum value of civil engineering works executed in any one year during the last five years (updated to **2025-26** price level) taking into account the completed as well as works in progress.

N = Number of years prescribed for completion of the works for which tenders are invited. = 1.

2 B = Value, at **2025-26** price level, of existing commitments and on-going works to be completed during the next **1** years (period of completion of the works for which Tenders are invited) *

Note: The statements showing the value of existing commitments and on-going works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the Employer in charge, not below the rank of an Executive Engineer or equivalent.

3.8. Even though the Tenderers meet the above criteria, they are subject to be disqualified if they have:

- made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or
- record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.; and/or
- participated in the previous Tender for the same work and had quoted unreasonably high tender prices and could not furnish rational justification.

## 4. One Tender per Tenderer :

4.1 Each tenderer shall submit only one tender for one package. A tenderer who submits or participates in more than one Tender (other than as a sub-contractor or in cases of alternatives that have been permitted or requested) will cause all the proposals with the Tenderers participation to be disqualified.

## 5. Cost of Tendering:

5.1 The tenderer shall bear all costs associated with the preparation and submission of his tender, and the Employer will in no case be responsible and liable for those costs.

**6. Site visit:**

6.1 The Tenderer at his own responsibility and risk is encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Tender and entering into a contract for construction of the Works. The cost of visiting the Site shall be at the Tenderers own expense.

## B. Tender documents

**7. Content of Tender documents**

7.1 The tender documents shall have all the Sections given in Page 2:

7.2 The tender document should be completed and uploaded

**8. Clarification of Tender Documents**

8.1 A prospective tenderer requiring any clarification of the tender documents may notify the Employer through the fax/e-mail/Letter. All queries should be e-mailed along with hard copy on or before the Seven (7) days from date of bid submission. All queries and replies will be uploaded on website **www.kppp.karnataka.gov.in.** and can be viewed by all participating tenderers.

**9. Amendment of Tender documents**

9.1 Before the deadline for submission of tenders, the Employer may modify the tender documents by issuing Addenda.

9.2 Any Addendum thus issued shall be part of the tender documents and shall be communicated in writing or by cable or by mail to all the purchasers of the tender documents or the same may be uploaded in e-portal.

9.3 To give prospective Tenderers reasonable time in which to take an Addendum into account in preparing their tenders, the Employer shall extend as necessary the deadline for submission of tenders, in accordance with Sub-Clause 16.2 below.

## C. Preparation of Tenders

**10. Documents comprising the Tender**

10.1 The tender submitted in e-procurement by the Tenderer shall contain the documents as follows:

(a) Evidence of Earnest Money Deposit payment;
(b) Scanned copies of Qualification Information as per formats given in Section 3;
(c) The form of Tender (in the format indicated in Section 4) duly signed
(d) Priced Bill of Quantities (Section 9);

and any other materials required to be completed and submitted by Tenderers in accordance with these instructions. The documents listed under Sections 3, 4, 6 and 9 shall be filled in without exception.

10.2 Tenderers submitting tenders together with other contracts stated in the IFT to form a package will so indicate in the tender together with any discounts offered for the award of more than one contract.

## 11. Tender prices

11.1 The contract shall be for the whole works as described in Sub-Clause 1.1, based on the priced Bill of Quantities submitted by the Tenderer.

11.2 The bidder shall fill in the unit rates in figures for all items of the Works described in the Bill of Quantities. The system will automatically convert the unit rates mentioned in figures to words and also calculate the amount of that item as well as the total Bid value. *Items for which no rate is entered by the bidder will not be paid for by the Employer when executed and shall be deemed covered by the other rates in the Bill of Quantities*

11.3 All duties, taxes, and other levies payable by the contractor under the contract, or for any other cause, shall be included in the rates and **excluding GST,** prices and total Tender Price submitted by the Tenderer.

11.4 The rates and prices quoted by the Tenderer shall be subject to adjustment during the performance of the Contract in accordance with the provisions of Clause 40 of the Conditions of Contract for the contract with period of completion is more than 12 months.

## 12. Tender validity

12.1 Tenders shall remain valid for a period not less than **ninety (90) days** after the deadline date for tender submission specified in Clause 16. A tender valid for a shorter period shall be rejected by the Employer as non-responsive.

12.2 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the Tenderers may extend the period of validity for a specified additional period. The request and the Tenderers responses shall be made in writing or by cable or e-mail. A Tenderer may refuse the request without forfeiting his earnest money deposit. A Tenderer agreeing to the request will not be required or permitted to modify his tender, but will be required to extend the validity of his earnest money deposit for a period of the extension, and in compliance with Clause 13 in all respects.

## 13. Earnest Money Deposit

13.1 The Tenderer shall furnish, as part of his tender, Earnest Money Deposit in the amount as shown in column 4 of the Table of IFT for this particular work. EMD can be paid through OTC, NEFT, DEBIT CARD and CREDIT CARD through e-portal only.

13.2 Deleted.

13.3 Any tender not accompanied by an acceptable earnest money deposit and not secured as indicated in Sub-Clauses 13.1 and 13.2 above shall be rejected by the Employer as non-responsive.

13.4 The earnest money deposit of unsuccessful Tenderers will be returned within 30 days of the end of the tender validity period specified in Sub-Clause 12.1.

13.5 The earnest money deposit of the successful Tenderer will be discharged when the Tenderer has signed the Agreement and furnished the required Performance Security.

13.6 The earnest money deposit may be forfeited:

(a) if the Tenderer withdraws the Tender after tender opening during the period of tender validity;
(b) if the Tenderer does not accept the correction of the Tender Price, pursuant to Clause 24; or
(c) in the case of a successful Tenderer, if the Tenderer fails within the specified time limit to
  (i) sign the Agreement; or
  (ii) furnish the required Performance Security deposit

**14. Format and signing of Tender**

14.1 The completed bid comprising of documents indicated in ITB 10, should be uploaded in the e-procurement wizard of Government of Karnataka through “e-portal” along with scanned copies of requisite certificates those are mentioned in different sections in the bid document and EMD shall be paid through OTC, NEFT, DEBIT CARD and CREDIT CARD through e-portal only.

14.2 All the documents should be uploaded to the e-procurement wizard of GOK. Tenderer should take a print out of the declaration letters provided in the website on company letter head and should sign, stamp and upload the same to the e-procurement wizard.

14.3 Deleted

## D. Submission of Tenders

**15. Up-loading & submission of tenders**

15.1 The tenders should be uploaded only through e-portal system. Tender should contain

**A. Technical Tender consisting of following**:

a. All the documents with required details in prescribed format; those are mentioned in different sections in the Tender. Form of Tender, Declaration statement regarding Customs/ Excise duty exemption for materials/ construction equipment brought to site as mentioned in Section 2, etc., shall be downloaded, filled with required

details, signed, scanned & uploaded to the e-procurement website **www.kppp.karnataka.gov.in** on or before the time and date indicated in notification /Section I IFT.

b. **Tender security (Earnest money deposit).** Tender security can be paid in the form of OTC,NEFT,DEBIT CARD,CREDIT CARD in e-procurement of Gov. of Karnataka.

The above documents along with notarized copies of documentary evidences as indicated in Section—2 ITT, Section-3 Qualification information & Section 4 -"Form of Tender" shall be scanned and uploaded to the website compulsorily, failing which tender will be rejected in view of incomplete bid document and

**B. Financial Tender consisting of Bill of Quantities (file name: BOQ.xls).**

The tenderer shall down load the bill of quantities and key in the rates (in figures only) in the Bill of Quantities sheet and upload the same file on to the website on or before the time and date indicated in notification /Section 1 IFT.

In case of failure of the tenderer to upload the same within stipulated time their tender will be rejected.

**NOTE:**

1. URL of the Website for tender submission through Karnataka public Procurement portal & Address for uploading of Tender security is **www.kppp.karnataka.gov.in.**

2. The details related to submission of tenders, downloading / uploading of documents or other details are available online in the help wizard, Vendor manual & FAQ of above website. The same is provided along with sample formats in Annexure-I of the Bid document for ready reference.

15.2 Deleted

15.3 Unique Identification Number will be automatically generated by the server with time -stamp and sent to the account of the bidder as an acknowledgement after bidder finally uploads the bids.

15.4 Deleted

## 16. Deadline for submission of the Tenders

16.1 Tenderers must upload the Tenders no later than 28/07/2025 upto 15.00 hrs

16.2 The Employer may extend the deadline for submission of tenders by issuing an amendment in accordance with Clause 9, in which case all rights and obligations of the Employer and the Tenderers previously subject to the original deadline will then be subject to the new deadline.

## 17. Late Tenders

17.1 The software of e-procurement system will not allow the Bidder to upload the documents after expiration of the stipulated date & time of Bid submission. The Bidder shall refer the server time, which will be displayed in the e-procurement portal. Employer will not be responsible for non-receipt of bids on the stipulated date & time prescribed in clause 16, due to Internet Problems, improper uploading or any other related problems. In case of connectivity problems, Tenderer may contact Helpdesk of the e-tender service provider and may also draw the attention of tender inviting authority.

**18. Modification and Withdrawal of Tenders**

18.1 Tenderers may "modify" and "withdraw" their tenders multiple numbers of times, until the deadline for submission of tenders by operating the relevant provision made in e-tendering. If the Tenderer withdraws the tender before the deadline for submission of tenders and later if he is interested to submit the tender once again, may do so within the stipulated date & time as mentioned in Clause 16

18.2 Deleted.

18.3 No Tender may be modified after the deadline for submission of Tenders.

18.4 Withdrawal or modification of a Tender between the deadline for submission of Tenders and the expiration of the original period of Tender validity specified in Clause 12.1 above or as extended pursuant to Clause 12.2 may result in the forfeiture of the earnest money deposit pursuant to Clause 13.

18.5 Deleted

**E. Tender opening and evaluation**

**19. Opening of Technical portion of Tenders and evaluation to determine qualified Tenderers:**

19.1 The Employer will open the Technical details of all the Tenders received (except those withdrawn), including modifications made pursuant to Clause 18, in the presence of the Tenderers or their representatives who choose to attend at the employers office mentioned in the earlier para at 16:00 hours on the date and place specified above. In the event of the specified date of Tender opening being declared a holiday for the Employer, the Tenders will be opened at the appointed time and location on the next working day.

19.2 Deleted.

19.3 The Tenderers names, the presence or absence of earnest money deposit (amount, format and validity), the submission of qualification information and such other information as the

Employer may consider appropriate will be announced by the Employer at the opening.

19.4 The Employer shall prepare minutes of the Tender opening, including the information disclosed to those present in accordance with Sub-Clause 19.3.

19.5 The Price Tenders of all the Tenderers including modifications for Financial tenders can not be opened as this is programmed to open later after evaluation of the Technical details of the participating Tenderers.

19.6 The Employer will evaluate and determine whether each tender (a) meets the eligibility criteria defined in ITT Clause 2; (b) is accompanied by the required earnest money deposit as per stipulations in ITT Clause and (c) meets the minimum qualification criteria stipulated in ITT Clause 3. The Employer will draw out a list of qualified Tenderers.

**20. Opening of Second Cover of qualified Tenderers and evaluation:**

20.1 The Employer will inform all the Qualified Tenderers the time, date and venue fixed for the opening of the price Tenders. The Employer will open the price tender of Qualified Tenderers at the appointed time and date in the presence of the Tenders or their representatives who choose to attend. In the event of the specified date of Price tender opening being declared a holiday for the Employer, the price tenders will be opened at the appointed time and location on the next working day.

20.2 Deleted.

20.3 The Tenderers' names, the Tender prices, the total amount of each Tender, any discounts, and withdrawals, and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening. No Tender shall be rejected at Tender opening.

20.4 The Employer shall prepare minutes of the Price Tender opening, including the information disclosed to those present in accordance with Sub-Clause 20.3.

**21. Process to be confidential**

21.1 Information relating to the examination, clarification, evaluation, and comparison of Tenders and recommendations for the award of a contract shall not be disclosed to Tenderers or any other persons not officially concerned with such process until the award to the successful Tenderer has been announced. Any effort by a Tenderer to influence the Employer's processing of Tenders or award decisions may result in the rejection of his Tender.

**22 Clarifications of Tenders**

22.1 To assist in the examination, evaluation, and comparison of Tenders, the Employer may, at his discretion, ask any Tenderer

for clarification of his Tender, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by cable, but no change in the price or substance of the Tender shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Tenders in accordance with Clause 24.

22.2 Subject to sub-clause 22.1, no Tenderer shall contact the Employer on any matter relating to its Tender from the time of the Tender opening to the time the contract is awarded. If the Tenderer wishes to bring additional information to the notice of the Employer, it should do so in writing.

22.3 Any effort by the Tenderer to influence the Employer in the Employer’s Tender evaluation, Tender comparison or contract award decisions may result in the rejection of the Tenderers’ Tender.

## 23. Examination of Tenders and determination of responsiveness

23.1 Prior to the detailed evaluation of Tenders, the Employer will determine whether each Tender; (a) has been properly signed; and; (b) is substantially responsive to the requirements of the Tender documents like [(a) Form of Tender, furnished as per Section 2, 3 & 4 of the tender,]; (b) is accompanied by the required securities and; (c) is substantially responsive to the requirements of the tendering documents.

23.2 A substantially responsive Tender is one which conforms to all the terms, conditions, and specifications of the Tender documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works; (b) which limits in any substantial way, inconsistent with the Tender documents, the Employer's rights or the Tenderer's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other Tenderers presenting substantially responsive Tenders.

23.3 If a Tender is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the nonconforming deviation or reservation.

## 24. Correction of errors

24.1 (a) Once the Tenderer key in the rates in figures, in the Bill of quantities provided, rate in words will be auto generated by the system.

(b) Once the Tenderer key in the rates in figures, in the Bill of quantities provided, the system will automatically calculate the amount of that item as well as the total Bid value.

24.2 Deleted

## 25. Evaluation and comparison of Tenders

25.1 The Employer will evaluate and compare only the Tenders determined to be substantially responsive in accordance with Clause 23.

25.2 In evaluating the Tenders, the Employer will determine for each Tender the evaluated Tender Price by adjusting the Tender Price as follows:

(a) making any correction for errors pursuant to Clause 24; and

(b) making appropriate adjustments to reflect discounts or other price modifications offered in accordance with Sub Clause 18.5.

25.3 The Employer reserves the right to accept or reject any variation, deviation, or alternative offer. Variations, deviations, and alternative offers and other factors which are in excess of the requirements of the Tender documents or otherwise result in unsolicited benefits for the Employer shall not be taken into account in Tender evaluation.

25.4 The estimated effect of the price adjustment conditions under Clause 41 of the Conditions of Contract, during the implementation of the Contract, will not be taken into account in tender Evaluation

25.5 If the tender of the successful tenderer is seriously unbalanced in relation to the Employer's estimate of the cost of the work to be performed under the contract, the Employer may require the Tenderer to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require that the amount of the performance security set forth in Clause 29 be increased at the expense of the successful Tenderer to a level sufficient to protect the Employer against financial loss in the event of default of the successful under the contract.

## F. Award of Contract

## 26. Award criteria

26.1 Subject to Clause 27, the Employer will award the Contract to the Tenderer whose Tender has been determined to be substantially responsive to the Tender documents and who has offered the lowest evaluated Tender Price, provided that such Tenderer has been determined to be (a) eligible in accordance with the provisions of Clause 2, and (b) qualified in accordance with the provisions of Clause 3.

## 27. Employer's right to accept any Tender and to reject any or all Tenders

27.1 Notwithstanding Clause 26, the Employer reserves the right to accept or reject any Tender, and to cancel the Tender process and reject all Tenders, at any time prior to the award of Contract, without thereby incurring any liability to the affected Tenderer or Tenderers or any obligation to inform the affected Tenderer or Tenderers of the grounds for the Employer's action.

## 28. Notification of award and signing of Agreement

28.1 The Tenderer whose Tender has been accepted will be notified of the award by the Employer prior to expiration of the Tender validity period by cable, telex, e-mail or facsimile confirmed by registered letter. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") will state the sum that the Employer will pay the Contractor in consideration of the execution, completion, and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").

28.2 The notification of award will constitute the formation of the Contract, subject only to the furnishing of Security deposit in accordance with the provisions of Clause 29.

28.3 The Agreement will incorporate all agreements between the Employer and the successful Tenderer. It will be kept ready for signature of the successful Tenderer in the office of Employer within 30 days following the notification of award along with the Letter of Acceptance. Within 20 days of receipt, the successful Tenderer will sign the Agreement and deliver it to the Employer.

28.4 Upon the furnishing by the successful Tenderer of the Performance Security, the Employer will promptly notify the other Tenderers that their Tenders have been unsuccessful.

## 29. Security deposit

29.1 Within 20 days of receipt of the Letter of Acceptance, the successful Tenderer shall deliver to the Employer a Security deposit in any of the forms given below for an amount equivalent to 5% of the Works Contract price plus additional security for unbalanced tenders in accordance with Clause 25.5 of ITT and Clause 44 of the Conditions of Contract. :

1 - Cash or

2 - Banker’s cheque/Demand draft,/Pay Order in favour of ***Chairman, BWSSB*** payable at ***Bangalore*** or

3 - A bank guarantee in the form given in Section 10;

29.2 If the security deposit is provided by the successful Tenderer in the form of a Bank Guarantee, it shall be issued either by a Nationalized/Scheduled bank.

29.3 The security deposit if furnished in cash or demand draft can, if requested, be converted to interest bearing securities at the cost of the contractor.

29.4 Failure of the successful Tenderer to comply with the requirements of Sub-Clause 29.1 shall constitute sufficient grounds for cancellation of the award and forfeiture of the Earnest money deposit.

## 30 Advance Payment and Security:

30.1 The Employer will provide an advance payment on the contract price as stipulated in the Conditions of Contract, subject to the maximum amount as stated in the Contract Data.

## 31. Corrupt or Fraudulent practices

31.1 The GoK requires that the Tenderers/Suppliers/Contractors, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, GoK :

(a) will reject a proposal for award if it determines that the Tenderer recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;

(b) will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a GoK contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a GoK contract.

31.2 Furthermore, Tenderers shall be aware of the provision stated in sub-clause 50.2 of the Conditions of Contract.

## SECTION 3:

## QUALIFICATION INFORMATION

## QUALIFICATION INFORMATION

The following form is to be downloaded, particulars are to be filled, scanned & uploaded by the Tenderers, to the e-procurement portal of Government of Karnataka **"www.kppp.karnataka.gov.in"** along with the Tender.

Note: The detailed procedure for downloading / uploading the documents will be available in Help wizard, Vendor manual & FAQ of the above mentioned Website.

The information to be filled in by the Tenderer hereunder will be used for purposes of computing Tender capacity as provided for in Clause 3 of the Instructions to Tenderers. This information will not be incorporated in the Contract.

1.1 Constitution or legal status of Tenderer [Attach copy]
Place of Registration _____
(Attach Copy)

Principal place of business: _____

1.2 Total value of civil engineering construction works executed and payments received in the last five years (in Rs. Lakhs)

2020 – 21 _____

2021 – 22 _____

2022 – 23 _____

2023 – 24 _____

2024- 25 _____

1.3 Work performed as Prime Contractor (in the same name) on works of similar nature over during the five years specified in ITT 3.2 (a) above.

| Project Name | Name of Employer | Description of Work | Contract Number | Value of contract Rs. Lakhs | Date of issue of work order | Specified period of completion | Actual date of completion | Remarks explaining reasons for delay in completion of work |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

1.4 Quantities of work executed as prime contractor (in the same name) during the last five years specified in ITT 3.2 (c) above:

| Year | Name of | Name of | Quantity of work | Remarks |
|---|---|---|---|---|

| | Work | Employer | performed | | (other details e.g. Similar Works) |
|---|---|---|---|---|---|
| | | | Concrete Qty (Cum) | FormWork (m) | |
| 2020-21 | | | | | |
| 2021-22 | | | | | |
| 2022-23 | | | | | |
| 2023-24 | | | | | |
| 2024-25 | | | | | |

1.5 Information on works for which Tenders have been submitted and works which are yet to be completed as on the date of this Tender.

(A) Existing commitments and on-going works:

| Description of Work | Place& State | Contract No. & Date | Name and Address of Employer | Value of Contract (Rs. lakhs) | Stipulated period of completion | Value of works remaining to be completed (Rs. lakhs) | Anticipated date of completion |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | | | | | | | |

(B) Works for which Tenders already submitted:

| Description of Work | Place & State | Name and Address of Employer | Estimated value of works (Rs. lakhs) | Stipulated Date period of completion | when decision is expected | Remarks if any |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | |

1.6. The following items of equipment are considered essential for successfully carrying out the works. The Tenderer should furnish all the information listed below.

| Item of Equipment | Requirement | | | Owned and available | | Remarks |
|---|---|---|---|---|---|---|
| | No. | Capacity | Owned | Number/ Capacity | Age/ Condition | |
| | | | | | | |

1.7 Reports on the financial standing of the tenderer, such as profit and loss statements and auditor’s reports for the last five years;

1.8 Qualification and experience of the key technical and management personnel in permanent employment with the tenderer and those that are proposed to be deployed on this contract, if awarded.

1.9. Name, address, and telephone, telex, and fax numbers of the Tenderers' bankers who may provide references if contacted by the Employer.

1.10 Evidence of access to financial resources to meet the qualification requirement specified in ITT Clause3.3 (b): Cash in hand, Letter of Credit etc. List them below and attach certificate from the Banker in the suggested format as under:

## BANKER'S CERTIFICATE

This is to certify that M/s. ..... is a reputed company with a good financial standing. If the contract for this work, namely ..... (name of the work) is awarded to the above firm, we shall be able to provide overdraft/credit facilities to the extent of Rs. ..... to meet the working capital requirements for executing the above contract

Sd/-
Name of the Bank, Senior Bank Manger
Address:
.....

1.11 Proposals for subcontracting components of works amounting to more than 20% of the contract price .

| Item of Work | Value of Sub-Contract | Identified Sub-Contractor (Name and address) | Experience of similar work |
|---|---|---|---|
| | | | |
| | | | |

1.12 Information on litigations in which the Tenderer is involved:

| Other Party (ies) | Employer | Details of dispute | Amount involved | Remarks showing present status |
|---|---|---|---|---|
| | | | | |

1.13 The proposed methodology and program of construction, backed with equipment planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion as per milestones.

## SECTION 4:

## FORMS OF TENDER, LETTER OF ACEPTANCE, NOTICE TO PROCEED WITH THE WORK AND AGREEMENT FORM

## Form of Tender

Description of the Works: **Tender for the Work of Providing Asphalt on BWSSB Pipeline Road from Arkavathi Bridge of Kanakapura Taluk to Agrahara Village coming under AEE(K-O&M)-2-1 Harohalli .**

To

*Chief Engineer (K-O&M)*
Bangalore Water Supply & Sewerage Board
*6th floor, Cauvery Bhavan*
*K.G.Road, Bangalore -560 009*

GENTLEMEN,

We offer to execute the Works described above in accordance with the Conditions of Contract accompanying this Tender for the Contract Price uploaded for this tender to be opened after qualification.

This Tender and your written acceptance of it shall constitute a binding contract between us. We understand that you are not bound to accept the lowest or any Tender you receive.

The advance payment required is Rs.....

We undertake that, in competing for (and, if the award is made to us, in executing) the above contract, we will strictly observe the laws against fraud and corruption in force in India namely "Prevention of Corruption Act 1988".

We hereby confirm that this Tender complies with the Tender validity and Earnest money deposit required by the Tender documents.

We attach herewith our current income-tax clearance certificate.

Yours faithfully,

Authorized Signature:

Name & Title of Signatory:

_____

Name of Tenderer _____

Address: ----------

---

**NOTE: This form shall be download, filled and printed on the Company letter head, signed, Scanned and uploaded. Failure to furnish the signed copy will lead to Non-Responsive Tender.**

**Letter of Acceptance**

(letterhead paper of the Employer)
_____[date]

To:

_____
[name and address of the Contractor]

Dear Sirs,

This is to notify you that your Tender dated _____ for execution of the _____ _____ [name of the contract and identification number, as given in the Instructions to Tenderers] for the Contract Price of Rupees —— _____ (_____) [amount in words and figures], as corrected and modified in accordance with the Instructions to Tenderers is hereby accepted by this office

You are hereby requested to furnish Security deposit plus additional security for unbalanced tenders in terms of Clause 25.5 of ITT, in the form detailed in Clause 29.1 of ITT for an amount of Rs.———— within 20 days of the receipt of this letter of acceptance valid up to 30 days from the date of expiry of Defects Liability Period i.e. up to ..... and sign the contract, failing which action as stated in Para 29.4 of ITT will be taken.

Yours faithfully,

Authorized Signature
Name and Title of Signatory
Name of officer

---

**Issue of Notice to proceed with the work**

(letterhead of the Employer)
———— (date)
To
————————————— (name and address of the Contractor)
—————————————
—————————————

Dear Sirs:

Pursuant to your furnishing the requisite security deposit as stipulated in ITT Clause 29.1 and signing of the contract agreement for the construction of ————————[name of the contract] a Tender Price of Rs. ————————, you are hereby instructed to proceed with the execution of the said works in accordance with the contract documents.

Yours faithfully,

(Signature, name and title of signatory authorized to sign on behalf of Employer)

**Agreement Form**
**Agreement**

This agreement, made the _____day of _____20_____, between_____ _____[name and address of Employer] (hereinafter called "the Employer") of the one part and _____ _____ _____ _____ __ _____[name and address of contractor] (hereinafter called "the Contractor") of the other part.

Whereas the Employer is desirous that the Contractor execute _____ _____ _____ _____[name and identification number of Contract] (hereinafter called "the Works") and the Employer has accepted the Tender by the Contractor for the execution and completion of such Works and the remedying of any defects therein at a contract price of Rupees.....

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expression shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement.

2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all aspects with the provisions of the Contract.

3. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying the defects wherein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.
4. Jurisdiction of Courts /Arbitration:The sitting of Arbitration shall be held at Bangalore only and nowhere else.
5. Dispute of any kind arising out of the Contract shall be resolved within the jurisdiction of Bangalore City only and the parties agree and clearly understand that the Courts /Tribunals situated at Bangalore Metropolitan City have exclusive jurisdiction for the

redressed of the disputes arising out of the Contract and at no other place.

6. The parties further agree and understand that the place or places of issue of bank guarantee other than Bangalore will have no jurisdiction to resolve dispute of any kind relating to enforcement of the bank guarantees submitted by the contractor at Bangalore for the execution of the contract at Bangalore.
7. The Contractor shall comply with all legal requirements in the matter of employment of workmen and provide all safety gadgets to the workmen while working in the hazardous place or conditions during the execution of the contract.
8. Contractor shall be fully responsible in the event of death of employee/workmen during the execution of the work and liable to pay adequate compensation to the dependants of employee/workmen as per law.

9. On his/ their failure, if the Board is made to pay compensation the same shall be recovered by the Board from the contractor out of the amount due to the contractor or by appropriate legal action.
10. If death of any employee occurs during execution of work due to negligence of contractor, the contract will be liable for termination.
11. In the event of such termination, the employer may consider blacklisting of firm after due notice.
12. In case of any death or accident the contract will be cancelled after following due process.
13. The Board will be entitled to claim exemplary damages from the contractor in case of death of any work man / employees of the contractor in any of the BWSSB works as it damages the reputation of the Board.
14. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz:

    i) Letter of Acceptance;
    ii) Notice to proceed with the works;
    iii) Contractor’s Tender;
    iv) Contract Data;
    v) Conditions of contract (including Special Conditions of Contract);
    vi) Specifications;
    vii) Drawings;
    viii) Bill of Quantities; and
    ix) Any other document listed in the Contract Data as forming part of the contract.

In witness whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

The Common Seal of _____was hereunto affixed in the presence of:

Signed, Sealed and Delivered by the said _____

in the presence of:

Binding Signature of Employer _____

Binding Signature of Contractor _____

**SECTION 5:**

**CONDITIONS OF CONTRACT**

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# Conditions of Contract

## A. General

### 1. Definitions

1.1 Terms which are defined in the Contract Data are not also defined in the Conditions of Contract but keep their defined meanings. Bold letters are used to identify defined terms.

**Bill of Quantities** means the priced and completed Bill of Quantities forming part of the Tender.

**Compensation events** are those defined in Clause 38 hereunder.

The **Completion Date** is the date of completion of the Works as certified by the Employer in accordance with Sub Clause 46.1.

The **Contract** is the contract between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause 2.2 below.

The **Contract Data** defines the documents and other information which comprise the Contract.

The **Contractor** is a person or corporate body whose Tender to carry out the Works has been accepted by the Employer.

The **Contractor's Tender** is the completed Tender document submitted by the Contractor to the Employer.

The **Contract price** is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

**Days** are calendar days; months are calendar months.

A **Defect** is any part of the Works not completed in accordance with the Contract.

The **Defects liability period** is the period named in the Contract Data and calculated from the Completion Date.

The **Employer** is the party who will employ the Contractor to carry out the Works.

Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

The **Initial Contract price** is the Contract Price listed in the Employer's Letter of Acceptance.

The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Employer by issuing an extension of time.

**Materials** are all supplies, including consumables, used by the contractor for incorporation in the Works.

**Plant** is any integral part of the Works which is to have a mechanical, electrical, electronic or chemical or biological function.

The **Site** is the area defined as such in the Contract Data.

**Specification** means the Specification of the Works included in the Contract and any modification or addition made or approved by the Employer.

The **Start Date** is given in the Contract Data. It is the date when the Contractor shall commence execution of the works. It does not necessarily coincide with any of the Site Possession Dates.

A **Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract which includes work on the Site.

A **Variation** is an instruction given by the Employer which varies the Works.

The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the Contract Data.

## 2. Interpretation

2.1 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Employer will provide instructions clarifying queries about the Conditions of Contract.

2.2 The documents forming the Contract shall be interpreted in the following order of priority:

(1) Agreement
(2) Letter of Acceptance, notice to proceed with the works
(3) Contractor’s Tender
(4) Contract Data
(5) Conditions of Contract
(6) Specifications
(7) Drawings
(8) Bill of quantities and
(9) any other document listed in the Contract Data as forming part of the Contract.

## 3. Law governing contract

3.1 The law governing the Contract is the Laws of India supplanted by the Karnataka Local Acts.

## 4. Employer's decisions

4.1 Except where otherwise specifically stated, the Employer will decide contractual matters between the Employer and the Contractor.

## 5. Delegation

5.1 The Employer may delegate any of his duties and responsibilities to other people after notifying the Contractor and may cancel any delegation after notifying the Contractor.

## 6. Communications

6.1 Communications between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective only when it is delivered (in terms of Indian Contract Act).

## 7. Subcontracting

7.1 Deleted

## 8. Other Contractors

8.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer.

## 9. Personnel

9.1 The Contractor shall employ the technical personnel (of number and qualifications) as may be stipulated by GOK from time to time during the execution of the work. The technical staff so employed shall be available at site as may be stipulated by the Employer.

9.2 If the Employer asks the Contractor to remove a person who is a member of the Contractor's staff or his work force stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

## 10. Employer's and Contractor's risks

10.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

## 11. Employer's risks

11.1 The Employer is responsible for the excepted risks which are:

(a) rebellion, riot commotion or disorder unless solely restricted to employees of the Contractor or his Sub-Contractors arising from the conduct of the Works; or

(b) a cause due solely to the design of the Works, other than the Contractor's design; or

(c) any operation of the forces of nature (in so far as it occurs on the Site) which an experienced contractor:

(i) could not have reasonably foreseen; or

(ii) could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures;

(A) prevent loss or damage to physical property from occurring by taking appropriate measures or

(B) insure against such loss or damage

## 12. Contractor's risks

12.1 All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks are the responsibility of the Contractor.

## 13. Insurance:

13.1 The Contractor shall prior to commencing the works, effect and thereafter maintain insurances , in the joint names of the Employer and the Contractor, (cover from the first working day after the Start Date to the end of Defects Liability Period), in the amounts stated in the Contract Data :

(a) for loss of or damage to the Works, Plants and Materials and the Contractor's equipment;

(b) for liability of both Parties for loss, damage, death and injury to third parties or their property arising out of the Contractor's performance of the Contract including the Contractor's liability for damage to the Employer's property other than the Works and

(c) for liability of both Parties and of any Employer's representative for death and injury to the Contractor's personnel except to the extent that liability arises from the negligence of the Employer, any Employer's representative or their Employees.

13.2 Policies and certificates for insurance shall be delivered by the Contractor to the Employer for his approval before the Start Date. All such insurance shall provide for compensation to be payable to rectify the loss or damage incurred. All payments received from insurers relating to loss or damage shall be held jointly by the Parties and used for the repair of the loss or damage or as compensation for loss or damage that is not to be repaired.

13.3 If the Contractor fails to effect or keep in force any of the insurances referred to in the previous sub-clauses or fails to provide satisfactory evidence, policies or receipts, the Employer may without prejudice to any other right or remedy, effect insurance for the cover relevant to such default and pay the premiums due and recover the same as a deduction from any other monies due to the Contractor. If no payments is due, the payment of the premiums shall be a debt due.

13.4 Alterations to the terms of an insurance shall not be made without the approval of the Employer.

13.5 Both Parties shall comply with any conditions of the insurance policies.

## 14. Site Investigation Reports:

14.1 The Contractor, in preparing the tender, shall rely on any site investigation reports referred to in the Contract data, supplemented by any information available to the Tenderer.

## 15. Queries about the Contract Data

15.1 The Employer will clarify queries on the Contract Data.

## 16. Contractor to construct the Works

16.1 The Contractor shall construct the Works in accordance with the Specification and Drawings.

## 17. The Works to be completed by the Intended Completion Date

17.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the program submitted by the Contractor, as updated with the approval of the Employer, and complete them by the Intended Completion Date.

## 18. Approval by the Employer:

18.1 The Contractor shall submit Specification and drawings showing the proposed Temporary Works to the Employer, who is to approve them if they comply with the Specifications and Drawings.

18.2 The Contractor shall be responsible for the design of Temporary Works

18.3 The Employer’s approval shall not alter the Contractor’s responsibility for design of the Temporary Works.

18.4 The Contractor shall obtain approval of third parties to the design of third parties to the design of the temporary Works where required.

18.5 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Employer before their use.

## 19. Safety

19.1 The Contractor shall be responsible for the safety of all activities on the Site.

## 20. Discoveries

20.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Employer. The Contractor is to notify the Employer of such discoveries and carry out the Employer's instructions for dealing with them.

## 21. Possession of the Site

21.1 The Employer shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date stated in the Contract Data the Employer is deemed to have delayed the start of the relevant activities and this will be Compensation Event.

## 22. Access to the Site

22.1 The Contractor shall allow the Employer and any person authorized by the Employer access to the Site, to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured / fabricated / assembled for the works.

## 23. Instructions

23.1 The Contractor shall carry out all instructions of the Employer which comply with the applicable laws where the Site is located.

## 24. Procedure for resolution of Disputes:

24.1 Deleted as per Order No. LAW-LAC/198/2024 Dt:16.11.2024.

24.2 Deleted as per Order No. LAW-LAC/198/2024 Dt:16.11.2024.

24.3 Deleted as per Order No. LAW-LAC/198/2024 Dt:16.11.2024.

# B. Time Control

## 25. Program

25.1 Within the time stated in the Contract Data the Contractor shall submit to the Employer for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works.

25.2 The Employer's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Employer again at any time. A revised Program is to show the effect of Variations and Compensation Events.

## 26. Extension of the Intended Completion Date

26.1 The Employer shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date.

26.2 The Employer shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Employer for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information.

## 27. Delays ordered by the Employer

27.1 The Employer may instruct the Contractor to delay the start or progress of any activity within the Works.

## 28. Management meetings

28.1 The Employer may require the Contractor to attend a management meeting. The business of a management meeting shall be to review the progress achieved and the plans for remaining work.

28.2 The responsibility of the parties for actions to be taken is to be decided by the Employer either at the management meeting or after the management meeting and stated in writing to be distributed to all who attended the meeting.

## C. Quality Control

### 29. Identifying defects

29.1 The Employer shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Employer may instruct the Contractor to search for a Defect and to uncover and test any work that the Employer considers may have a Defect

### 30. Tests

30.1 If the Employer instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect the test shall be a Compensation Event.

### 31. Correction of defects

31.1 The Employer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

31.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Employer’s notice.

### 32. Uncorrected defects

32.1 If the Contractor has not corrected a Defect within the time specified in the Employer’s notice, the Employer will assess the cost of having the Defect corrected, and the Contractor will pay this amount.



## D. Cost Control

### 33. Bill of Quantities (BOQ)

33.1 The BOQ shall contain items for the construction, installation, testing, and commissioning work to be done by the Contractor.

33.2 The BOQ is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the BOQ for each item

## 34. Variations

34.1 The Employer shall have power to order the Contractor to do any or all of the following as considered necessary or advisable during the progress of the work by him

(a) Increase or decrease of any item of work included in the Bill of Quantities (BOQ);
(b) Omit any item of work;
(c) Change the character or quality or kind of any item of work;
(d) Change the levels, lines, positions and dimensions of any part of the work;
(e) Execute additional items of work of any kind necessary for the completion of the works; and
(f) Change in any specified sequence, methods or timing of construction of any part of the work.

34.2 The Contractor shall be bound to carry out the work in accordance with any instructions in this connection, which may be given to him in writing by the Employer and such alteration shall not vitiate or invalidate the contract.

34.3 Variations shall not be made by the Contractor without an order in writing by the Employer, provided that no order in writing shall be required for increase or decrease in the quantity of an item appearing in the BOQ so long as the work executed conforms to the approved drawings.

34.4 The Contractor shall promptly request in writing the Employer to confirm verbal orders and the officer issuing oral instructions shall confirm it in writing with in 30days, failing which the work shall be carried out as though there is no variation. In case variation is approved, it shall be accompanied by BOQ, failing which the contractor shall be responsible for deviation, if any. Further, approval of the Board has to be obtained for the variation exceeding 5%.

## 35. Payments for Variations

35.1 Payment for increase in the quantities of an item in the BOQ up to 25% of that provided in the Bill of Quantities shall be made at the rates quoted by the Contractor.

35.2 For quantities in excess of 125% of the tendered quantity of an item as given in the BOQ, the Contractor shall be paid at the rate entered in or derived from in the Schedule of Rates (applicable for the area of the work and current at the time of award of contract) plus or minus the overall percentage of the original tendered rates over the current Schedule of Rates prevalent at the time of award of contract.

35.3 If there is no rate for the additional, substituted or altered item of the work in the BOQ, efforts would be made to derive the rates from those given in the BOQ or the Schedule of Rates (applicable for the area of the work and current at the time of award of contract) and if found feasible the payment would be made at the derived rate for the item plus or minus the overall percentage of the original tendered rates over the current Schedule of Rates prevalent at the time of award of contract

35.4 If the rates for additional, substituted or altered item of work cannot be determined either as at 35.1 or 35.2 or 35.3 above, the Contractor shall be requested to submit his quotation for the items supported by analysis of the rate or rates claimed, within 7 days.

1 35.5 If the Contractor's quotation is determined unreasonable, the Employer may order the Variation and make a change to the Contract Price which shall be based on Employer’s own forecast of the effects of the Variation on the Contractor's costs.

35.6 If the Employer decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

35.7 Under no circumstances the Contractor shall suspend the work on the plea of non-settlement of rates for items falling under this Clause.

**36. Submission of bills for payment**

36.1 The Contractor shall submit to the Employer monthly bills of the value of the work completed less the cumulative amount paid previously.

36.2 The Employer shall check the Contractor's bill and determine the value of the work executed which shall comprise of (i) value of the quantities of the items in the BOQ completed and (ii) valuation of Variations and Compensation Events.

36.3 The Employer may exclude any item paid in a previous bill or reduce the proportion of any item previously paid in the light of later information.

**37. Payments**

37.1 Payments shall be adjusted for deductions for advance payments, other recoveries in terms of the contract and taxes, at source, as applicable under the law. The Employer shall pay the Contractor the within 60 days of submission of bill. The Contractor shall be liable to pay liquidated damages for shortfall in progress. For Progress beyond the agreed programme, payment is subject to availability of the grants.

37.2 Items of the Works for which no rate or price has been entered in will not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

**38. Compensation events**

38.1 The following are Compensation events unless they are caused by the Contractor:

(a) The Employer does not give access to a part of the Site by the Site Possession Date stated in the Contract Data.
(b) The Employer orders a delay or does not issue drawings, specifications or instructions required for execution of works on time.
(c) The Employer instructs the Contractor to uncover or to carry out additional tests upon work which is then found to have no Defects.
(d) The Employer gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.
(e) The effect on the Contractor of any of the Employer's Risks.
(f) The Employer unreasonably delays issuing a Certificate of Completion.
(g) Other Compensation Events listed in the Contract Data or mentioned in the Contract.

38.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date is extended. The Employer shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended.

38.3 As soon as information demonstrating the effect of each Compensation event upon the Contractor's forecast cost has been provided by the Contractor, it is to be assessed by the Employer and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Employer shall adjust the Contract Price based on Employer's own forecast. The Employer will assume that the Contractor will react competently and promptly to the event.

38.4 The Contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor not having given early warning or not having cooperated with the Employer.

**39. Tax**

39.1 The rates quoted by the Contractor shall be deemed to be inclusive of the sales and other taxes that the Contractor will have to pay for the performance of this Contract. The Employer will perform such duties in regard to the deduction of such taxes at source as per applicable law. **Rate quoted by the tenderer shall be exclusive of GST.**

**40. Price Adjustment:**

40.1 Not Applicable
40.2 Not applicable.

**41. Liquidated damages**

41.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the Contract Data for each day that the Completion Date is later than the Intended Completion Date (for the whole of the works or the milestone as stated in the Contract Data).

The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages does not affect the Contractor's liabilities.

41.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Employer shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment of bill.

**42. Advance Payments:**

42.1 The Employer shall make payment to the Contractor of the amounts stated in the Contract Data by the date stated in the Contract Data, against provision by the Contractor of an unconditional bank guarantee in a form acceptable to the Employer issued by a Nationalized/Scheduled Bank in amounts equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest will not be charged on the advance payment.

42.2 The Contractor is to use the advance payment only to pay for Mobilization expenses required specifically for execution of the Works. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Employer.

1 42.3 The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuation of the work done, variations, price adjustments, compensation events or liquidated damages.

**43. Securities:**

43.1 The Security deposit (including additional security for unbalanced tenders) shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount and form and type of instrument acceptable to the Employer. The Security deposit shall be valid until a date 30 days from the date of expiry of Defects Liability Period and the additional security for unbalanced tenders shall be valid until a date 30 days from the date of issue of the certificate of completion.

**44. Cost of Repairs:**

44.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

## E. Finishing the Contract

**45. Completion**

45.1 The Contractor shall request the Employer to issue a Certificate of Completion of the Works and the Employer will do so upon deciding that the Work is completed.

**46. Taking over**

46.1 The Employer shall take over the Site and the Works within seven days of issuing a certificate of Completion.

**47. Final account**

47.1 The Contractor shall supply to the Employer a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Employer shall issue a Defect Liability Certificate and certify any final payment that is due to the Contractor within 90 days of receiving the Contractor's account if it is correct and complete. If it is not, the Employer shall issue within 90 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Employer shall decide on the amount payable to the Contractor and make payment within 60 days of receiving the Contractor’s revised account.

**48. As built drawings and /or Operating and Maintenance Manuals**

48.1 If “as built” Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the Contract Data.

48.2 If the Contractor does not supply the Drawings by the dates stated in the Contract Data, or they do not receive the Employer’s approval, the Employer shall withhold the amount stated in the Contract Data from payments due to the Contractor.

**49. Termination**

49.1 The Employer may terminate the Contract if the other party causes a fundamental breach of the Contract.

49.2 Fundamental breaches of Contract include, but shall not be limited to the following:

(a) the Contractor stops work for 45 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Employer;

(b) The Contractor becomes bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(c) the Employer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Employer;

(d) the Contractor does not maintain a security which is required;

(e) the Contractor has delayed the completion of works by the number of days for which the maximum amount of liquidated damages can be paid as defined in the Contract data; and

(f) if the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in the executing the Contract.

For the purpose of this paragraph : “corrupt practice” means the offering, giving, receiving or soliciting of any thing of value to influence the action of a public official in the procurement process or in contract execution. “Fraudulent practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower, and includes collusive practice among Tenderers (prior to or after Tender submission) designed to establish Tender prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition.”

49.3 When either party to the Contract gives notice of a breach of contract to the Employer for a cause other than those listed under Sub Clause 49.2 above, the Employer shall decide whether the breach is fundamental or not.

49.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

49.5 If the Contract is terminated the Contractor shall stop work immediately, make the Site safe and secure and leave the Site as soon as reasonably possible.

**50. Payment upon Termination**

50.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Employer shall prepare bill for the value of the work done less advance payments received up to the date of the bill, less other recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor the difference shall be a debt payable to the Employer.

50.2 If the Contract is terminated at the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Employer shall prepare bill for the value of the work done, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works and less advance payments received up to the date of the certificate, less other recoveries due in terms of the contract, and less taxes due to be deducted at source as per applicable law and make payment accordingly.

**51. Property**

51.1 All materials on the Site, Plant, Equipment, Temporary Works and Works are deemed to be the property of the Employer, if the Contract is terminated because of a Contractor's default.

**52. Release from performance**

52.1 If the Contract is frustrated by any event entirely outside the control of either the Employer or the Contractor the Employer shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which commitment was made.

## F. Special Conditions of Contract

**1. Labour :**

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

The Contractor shall, if required by the Employer, deliver to the Employer a return in detail, in such form and at such intervals as the Employer may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such other information as the Employer may require.

**2. Compliance with labour regulations:**

During continuance of the contract, the Contractor and his sub contractors shall abide at all times by all existing labour enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/bye laws/Acts/Rules/regulations including amendments, if any, on the part of the Contractor, Employer shall have the right to deduct any money due to the Contractor including his amount of security deposit. The Employer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

**3. Protection of Environment:**

The contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation. During continuance of the contract, the contractor and his sub-contractors shall abide at all times by all existing enactments on environmental protection and rules made there under, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority.

**4. Arbitration (Clause 24 )**

4.1 The procedure for arbitration shall be as follows:

Deleted as per Order No. LAW-LAC/198/2024 Dt:16.11.2024.

**5 Contractor to Co-ordinate his Work with Other Contractors**

5.1 The Contractor has to co-ordinate with the other concerned Contractors as already specified in Conditions of Contract for all such works as per the directions of Engineer in charge at no extra cost.

**1. Continuation of Work:**

6.1 In case of the depth of a contractor after executing the agreement / commencement of the work, his legal heir, if any eligible registered contractor and willing, can execute and complete the work at the accepted tender rates irrespective of the cost of the work.

6.2 The Management Meeting as per Clause 28 of Condition of Contract will be conducted by the Chairman, BWSSB.

6.3 **Jurisdiction of Courts /Arbitration**: Deleted as per Order No. LAW-LAC/198/2024 Dt:16.11.2024.

6.4 Dispute of any kind arising out of the contract shall be resolved within the jurisdiction of Bangalore City only and the parties agree and clearly understand that the courts / tribunals situated at Bangalore Metropolitan City have exclusive jurisdiction for the redressal of the disputes arising out of the contract and at no other place.

6.5 The parties further agree and understand that the place or places of issue of Bank Guarantee other than Bangalore will have no jurisdiction to resolve dispute of any kind relating to enforcement of the bank guarantees submitted by the contractor at Bangalore for the execution of the Contract at Bangalore.

6.6 The contractor shall comply with all the legal requirements in the matter of employment of workmen and provide all safety gadgets to the workmen while working in the hazards place or conditions during the execution of the contract.

6.7 Contractor shall be fully responsible in the event of death of employee / workman during the execution of the work and liable to pay adequate compensation to the dependents of employee/ workman as per law.

6.8 On his / their failure, if the Board is made to pay compensation the same shall be recovered by the Board from the contractor out of the amounts due to the contractor or by appropriate legal action.

6.9 If death of any employees occurs during execution of work due to negligence of contractor, the contract will be liable for termination.

6.10 In the event of such termination, the employer may consider blacklisting of firm after due notice.

6.11 In case of any death or accident the contract will be cancelled after following due process.

6.12 The Board will be entitled to claim exemplary damages from the contractor in case of death of any work man / employees of the contractor in any of the BWSSB works as it damages the reputation of the Board.

## Annexure:

LIST OF ORGANIZATIONS WHO ARE CONSIDERED AS APPOINTING AUTHORITY FOR APPOINTMENT OF ARBITRATORS

Deleted as per Order No. LAW-LAC/198/2024 Dt:16.11.2024.

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# SECTION 6:

# CONTRACT DATA

## CONTRACT DATA

The Employer is: **Bangalore Water Supply & Sewerage Board**
Name: *Represented by Chief Engineer (Kaveri-O&M)*
[1.1]

Address: **Bangalore Water Supply & Sewerage Board**
***6h floor, Cauvery Bhavan***
***K.G.Road, Bangalore -560009***

Name of authorized Representative: **Executive Engineer, (Kaveri-O&M)-2 Division,**
**BWSSB Harohalli**

The name and identification number of the Contract is : **Tender for the Work of Providing Asphalt on BWSSB Pipeline Road from Arkavathi Bridge of Kanakapura Taluk to Agrahara Village coming under AEE(K-O&M)-2-1 Harohalli**

The start date shall be the date of issue of notice to proceed with the work.
[1.1]

The Intended Completion Date for the whole of the Works is **12** Months with following milestones:

| Milestone | Physical work to be completed | Period from the date of issue of notice to proceed with the work |
|---|---|---|
| Milestone -1 | 100% completion of work | Twelve (12) Months |

Site Possession Date is
The Site is located near Haroohalli.
Defect liability Period is 12 months (365 Days)

Insurance requirements are as under: [13]

| Type of Cover | | Minimum Cover for Insurance |
|---|---|---|
| (i) | Works and of Plant and materials | The sum stated in the Agreement plus 20% |
| (ii) | Loss or damage to equipment | Full replacement cost |
| (iii) | Loss or damage to property of Third Party | Full replacement cost |
| (iv) | Personal injury or death insurance (a) for Third Party | Rs. 20.00 Lakh |
| | (b) for Contractor's employees or labour | In accordance with the statutory requirements applicable to Karnataka |

Price Adjustment Formula: “Not Applicable” [40]

The Liquidated damages for the whole of the works are
For Mile stone 1: Rs. 0.1% per day of the contract value pertaining to this mile stone*

The maximum amount of Liquidated Damages for the whole of the works is Ten Percent of Final Contract Price. [41]

The amounts of the advance payment are:
[42]

| Nature of Advance | Amount (Rs.) | Conditions to be fulfilled |
|---|---|---|
| 1. Mobilization | 5% of the Works Contract price | On submission of un-conditional Bank Guarantee. (to be drawn before end of 30 days) |

Repayment of advance payment for mobilization:
[42]

The advance loan shall be repaid with percentage deductions from the interim payments certified by the Engineer under the Contract. Deductions shall commence in the next Interim Payment Certificate following that in which the total of all such payments to the Contractor has reached not less than 15 percent of the Contract Price or 3 months from the date of payment of first installment of advance, whichever period concludes earlier, and shall be made at the rate of 7.5 percent of the amounts of all Interim Payment Certificates until such time as the loan has been repaid, always provided that the loan shall be completely repaid prior to the expiry of the original time for completion pursuant to Clauses 17 and 26.

The date by which “as-built” drawings readable scales in two sets are in hardcopy & suitable AutoCAD format required is within 30 days of issue of certificate of completion of Whole or Section of the Work as the case may be. [48]

The amount to be withheld for failing to supply “as built” drawings by the date required is Rs.4,00,000/- [48]

The following events shall also be fundamental breach of the contract:
[49.2]

1. The contractor has contravened Sub-clause 7.1 and Clause 9 of CC.

The percentage to apply to the value of the work not completed representing the Employer's additional cost for completing the Works shall be 30 percent.
[50.1]

# SECTION 7: TECHNICAL SPECIFICATIONS

## STANDARD SPECIFICATIONS AND CODE OF PRACTICE FOR CONSTRUCTION OF CONCRETE ROADS

# PART 1

# SITE CLEARANCE

## 1.1 Scope

This work shall consist of cutting, removing and disposing of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, top organic soil not exceeding 150 mm in thickness, rubbish etc., from the area of Works which in the opinion of the Engineer are unsuitable for incorporation in the Works, and such other areas as may be specified on the Drawings or by the Engineer. It shall include necessary excavation, backfilling of pits resulting from uprooting of trees and stumps to required compaction, handling, salvaging, and disposal of cleared materials. Clearing and grubbing shall be performed in advance of earthwork operations and in accordance with the requirements of these Specifications.

## 4.1 Preservation of Property/Amenities

Trees, shrubs, any other plants, pole lines, fences, signs, monuments, buildings, pipelines, sewers and all facilities within or adjacent to the site which are not to be disturbed shall be protected from injury or damage. The Contractor shall provide and install at his own expense, suitable safeguards approved by the Engineer for this purpose.

During clearing and grubbing, the Contractor shall take all adequate precautions against soil erosion, water pollution, etc., and where required, undertake additional Works to that effect vide relevant Clauses of section 3 Before start of operations, the Contractor shall submit to the Engineer for approval, his work plan including the procedure to be followed for disposal of waste materials, etc., and the schedules for carrying out temporary and permanent erosion control Works as stipulated in section 3.

## 4.2 Methods, Tools and Equipment

Only such methods, tools and equipment as are approved by the Engineer and which will not affect the property to be preserved shall be adopted for the Work. If the area has thick vegetation / roots / trees, a crawler or pneumatic tyred dozer of adequate capacity may be used for clearance purposes. The dozer shall have ripper attachments for removal of tree stumps. All trees, stumps, etc., falling within excavation and fill lines shall be cut to such depth below ground level that in no case these fall within 500 mm of the subgrade / foundation / bed level. Also, all vegetation such as roots, under-growths, grass and other deleterious matter unsuitable for incorporation in the Work shall be removed between fill lines to the satisfaction of the Engineer. On the areas beyond these limits, trees and stumps required to be removed as directed by the Engineer shall be cut down to 1 m below ground level so that these do not present any unsightly appearance.

All branches of trees extending above the roadway shall be trimmed as directed by the Engineer.

All excavations below the general ground level arising out of the removal of trees, stumps, etc., shall be filled with suitable material and compacted thoroughly so as to make the surface as these points conform to the surrounding area.
Ant-hills both above and below the ground, as are liable to collapse and obstruct free subsoil water flow shall be removed and their workings, which may extend to several meters, shall be suitably treated.

## 4.3 Disposal of Materials

All materials arising from clearing and grubbing operations shall be the property of Employer and shall be disposed of by the Contractor as hereinafter provided or directed by the Engineer.

Trunks and stumps of trees shall be cleaned of limbs and roots and stacked. Also boulders, stones and other materials usable in construction shall be neatly stacked as directed by the Engineer. Stacking stumps, boulders, stones etc., shall be done at specified spots with all lifts and lead.

All products of clearing and grubbing which, in the opinion of the Engineer, cannot be used or auctioned shall be cleared away from the site in a manner as directed by the Engineer. Care shall be taken to see that unsuitable

waste materials are disposed off in such a manner that there is no likelihood of these getting mixed up with the materials meant for construction.

### 4.4 Measurements for Payment

Clearing and grubbing shall be measured on area basis in terms of hectares. Clearing and grubbing of borrow areas shall be deemed to be a part of Works preparatory to embankment construction and shall be deemed to have been included in the rates quoted for the embankment construction item and no separate payment shall be made for the same. Cutting of trees up to 300 mm in girth including removal of stumps and roots, and trimming of branches of trees extending above the roadway shall be considered incidental to the clearing and grubbing operations. Removal of stumps left over after trees have been cut by any other agency shall also be considered incidental to the clearing and grubbing operations.

Cutting, including removal of stumps and roots of trees of girth above 300 mm and backfilling to required compaction shall be measured in terms of number according to the sizes given below:

Above 300 mm to 600 mm;
Above 600 mm to 900 mm;
Above 900 mm to 1800 mm; and
Above 1800 mm.

For this purpose, the girth shall be measured at a height of 1 m above ground or at the top of the stump if the height of the stump is less than 1 m from the ground.

### 4.5 Rates

The Contract unit rates for the various items of clearing and grubbing shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment and incidentals necessary to complete the work. These will also include removal of stumps of trees less than 300 mm in girth as well as stumps left over after cutting of trees carried out by another agency, excavation and back-filling to required density, where necessary, and handling, salvaging, piling and disposing of the cleared materials with all lifts and leads.

The Contract unit rates for cutting (including removal of stumps and roots) of trees of girth above 300 mm shall include excavation and back-filling to

required compaction, handling, salvaging, piling and disposing of the cleared materials with all lifts and lead.

Where a Contract does not include separate items of clearing and grubbing, the same shall be considered incidental to the earthwork items and the Contract unit prices for the same shall be considered as including clearing and grubbing operations.

**End of Part 1**

## PART 2
## EARTHWORKS

### 2.1 Applicable Codes

The following Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest revision of the codes shall be referred to.

a) IS 783 - 1985 - Code of practice for laying of concrete pipes.

(Reaffirmed 2017)

b) IS 3764 - 1992 - Excavation work - Code of Safety.
(Reaffirmed 2017)

c) IS 2720 - Methods of test for soils:
(Part-1) - 1983 - Preparation of dry soil samples for various tests.
(Reaffirmed 2015)
(Part-2) - 1973 - Determination of Water Content.
(Reaffirmed 2015)
(Part-4) - 1985 - Grain size analysis.
(Reaffirmed 2015)
(Part-5) - 1985 - Determination of liquid and plastic limit.
(Reaffirmed 2015)
(Part-7) - 1980 - Determination of water content - dry density relation using light compaction.
(Reaffirmed 2016)
(Part-9) - 1992 - Determination of dry density - moisture content by
constant weight of soil method.
(Reaffirmed 2016)
(Part-14) - 1983- Determination of density index (relative density) Cohesionless soils.
(Reaffirmed 2015)
(Part-22) - 1972 - Determination of organic matter.
(Reaffirmed 2015)
(Part-26) - 1987 - Determination of pH Value.
(Reaffirmed 2016)
(Part-27) - 1977- Determination of total soluble sulphates.
(Reaffirmed 2015)
(Part-28) - 1974- Determination of dry density of soils in place, by the sand replacement method.(Reaffirmed 2015)

(Part-33)-1971- Determination of the density in place by the ring and water
replacement method.(Reaffirmed 2015)
(Part-34) - 1972- Determination of density of soil in place by rubber baloon method.(Reaffirmed 2015)

(Part-38) - 1976- (Reaffirmed 2016) Compaction control test (Hilf Method).

## 2.2 General

The Contractor shall furnish all tools, plant, instruments, qualified supervisory personnel, labour, materials, any temporary works, consumables, any and everything necessary, whether or not such items are specifically stated herein for completion of the work in accordance with the Specifications.

The Contractor shall survey the site before excavation and set out all lines and establish levels. Such survey shall be carried out by taking accurate cross sections of the area perpendicular to established reference/grid lines at 8m intervals or nearer, if necessary, based on ground profile and thereafter properly recorded.

The excavation shall be carried out to correct lines and levels. This shall also include, where required, proper shoring to maintain excavations and also the furnishing, erecting and maintaining of substantial barricades around excavated areas and warning lamps at night.

The rates quoted shall also include for dumping of excavated material in regular heaps, bunds, riprap with regular slopes within the lead specified and levelling the same so as to provide natural drainage. Rock/soil excavated shall be stacked properly as approved by the Engineer. As a rule, all softer material shall be laid along the center of heaps, the harder and more weather resisting materials forming the casing on the sides and the top. Rock shall be stacked separately. Topsoil shall be stock piled separately for later re-use.

## 4.6 Clearing

The area to be excavated/filled shall be cleared of fences, trees, plants, logs, stumps, bush, vegetation, rubbish, slush, etc. and other objectionable matter. If any roots or stumps of trees are encountered during excavation, they shall also be removed. The material so removed shall be disposed off as approved by the Engineer. Where earth fill is intended, the area shall be

stripped of all loose/ soft patches, top soil containing objectionable matter/ materials before fill commences.

### 4.7 Classification

All materials to be excavated shall be classified by Engineer, into one of the following classes and shall be paid for at the rate tendered for that particular class of material. No distinction shall be made whether the material is dry, moist or wet. The decision of Engineer regarding the classification of the material shall be final and binding on Contractor and not be a subject matter of any appeal or arbitration.

Any earthwork will be classified under any of the following categories:

#### a) Ordinary & Hard Soils

These shall include all kinds of soils containing kankar, sand, silt, moorum and/or shingle, gravel, clay, loam, peat, ash, shale, etc., which can generally be excavated by spade, pick axes and shovel, and which is not classified under “soft and decomposed rock” and “hard rock” defined below. This shall also include embedded rock boulders not longer than 1 metre in any one direction and not more than 200 mm in any one of the other two directions.

#### b) Soft and Decomposed Rock

This shall include rock, boulders, slag, chalk, slate, hard mica schist, laterite, highly weathered granite gneiss and all other materials which in the opinion of Engineer is rock, but does not need blasting and could be removed readily with picks, hammer, crow bars, wedges, and pneumatic breaking equipment. The mere fact that Contractor resorts to blasting for reasons of his own, shall not qualify for classification under ‘hard rock’.

This shall also include excavation in macadam and tarred roads and pavements. This shall also include rock boulders not longer than 1 metre in any direction and not more than 500 mm in any one of the other two directions. Masonry to be dismantled will also be measured under this item.

#### c) Hard Rock

This shall include all rock occurring in large continuous masses which cannot be removed except by blasting, chiselling or by drilling with heavy

mechanical breakers. Harder varieties of rock with or without veins and secondary minerals which, in the opinion of Engineer require blasting shall be considered as hard rock. Boulders of rock occurring in such sizes and not classified under (a) and (b) above shall also be classified as hard rock.

Before classification of material as rock the Contractor shall demonstrate to the satisfaction of the Employer's Representative his inability to excavate it without resort to heavy percussion tools complete with rock bits, hydraulic wedges or blasting. Excavation in rock by the use of explosive or blasting is not permitted. The rock shall be removed by wedging, pick, barring, heating and quenching or other approved means.

Material shall not be classified as rock unless the Employer's Representative has agreed to such classification on the basis of such a demonstration before its excavation. Excavations where rock has been encountered and classified as such shall not be backfilled before examination of the excavated faces by the Employer's Representative to enable the extent of the rock excavation to be determined.

### 4.8 Excavation

All excavation work shall be carried out by mechanical equipment unless, in the opinion of Engineer, the work involved requires it to be carried out by manual methods.

Contractor may, for facility of work or similar other reasons excavate, and also backfill later, if so approved by Engineer, at his own cost outside the lines shown on the drawings or directed by Engineer. Should any excavation be taken below the specified elevations, Contractor shall fill it up, with concrete of the same class as in the foundation resting thereon, up to the required elevation. No extra shall be claimed by Contractor on this account.

All excavations shall be to the minimum dimensions required for safety and ease of working. Prior approval of the Engineer shall be obtained by the Contractor in each individual case, for the method proposed for the excavation, including dimensions, side slopes, dewatering, disposal, etc. This approval shall not in any way relieve the Contractor of his responsibility for any consequent loss or damage. The excavation must be carried out in the most expeditious and efficient manner. Side slopes shall be as steep as will stand safely for the actual soil conditions encountered. Every precaution shall be taken to prevent slips. Should slips occur, the

slipped material shall be removed and the slope dressed to a modified stable slope. Removal of the slipped earth will not be paid for if the slips are due to the negligence of Contractor.

### 4.9 Stripping Loose Rock

All loose boulders, detached rocks partially and other loose material which might move therewith not directly in the excavation but so close to the area to be excavated as to be liable, in the opinion of Engineer, to fall or otherwise endanger the workmen, equipment, or the work shall be stripped off and removed from the area of the excavation. The method used shall be such as not to render unstable or unsafe the portion which was originally sound and safe.

Any material not requiring removal in order to complete the permanent works, but which, in the opinion of Engineer, is likely to become loose or unstable later, shall also be promptly and satisfactorily removed. The cost of such stripping will be paid for at the unit rates accepted for the class of materials in question.

## 2.7 Earthen Embankment/Sub grade Construction

### 2.7.1 Scope

These Specifications shall apply to the construction of embankments including sub grades, earthen shoulders and miscellaneous backfills with approved materials obtained from roadway and drain excavation, borrow pits or other sources. All embankments, subgrade, earthen shoulders and miscellaneous backfills shall be constructed in accordance with the requirements of these Specifications and in conformity with the lines, grades, and cross-sections shown on the Drawings or as directed by the Engineer.

### 2.7.2Physical Requirements of materials

The materials used in embankments, sub grades, earthen shoulders and miscellaneous backfills shall be soil, moorum, gravel, a mixture of those or any other material approved by the Engineer. Such materials shall be free of logs, stumps, roots, rubbish or any other ingredient likely to deteriorate or affect the stability of the embankment/subgrade.

The following types of material shall be considered unsuitable for embankment:

Materials from swamps, marshes and bogs;
Peat, log, stump and perishable material; any soil that classifies as OL, OI, OH or Pt in accordance with IS: 1498.
Materials susceptible to spontaneous combustion;
Materials in a frozen conditions;
Clay having liquid limit exceeding 70 and plasticity index exceeding 45; and
Materials with salts resulting in leaching in the embankment.

Expansive clay exhibiting marked swell and shrinkage properties (“free swelling index” exceeding 50 percent when tested as per IS: 2720 Part 40) shall not be used as a fill material. Where expansive clay with acceptable “free swelling index” value is used as a fill material, subgrade and top 500 mm portion of the embankment just below subgrade shall be non-expansive in nature.

Any fill material with a soluble sulphate content exceeding 1.9 grams of sulphate (expressed as SO3) per litre when tested in accordance with BS: 1377 Test 10, but using a 2:1 water-soil ratio shall not be deposited within 500 mm or other distance described in the Contract, of concrete, cement bound materials or other cementitious materials forming part of the Permanent Works.

Materials with a total sulphate content (expressed as SO3) exceeding 0.5 percent by mass, when tested in accordance with BS: 1377 Test 9 shall not be deposited within 500 mm, or other distances described in the Contract, of metallic items forming part of the Permanent Works.

The size of the coarse material in the mixture of earth shall ordinarily not exceed 75 mm when being placed in the embankment and 50 mm when placed in the subgrade. However, the Engineer may at his discretion permit the use of material coarser than this also if he is satisfied that the same will not present any difficulty as regards the placement of fill material and its compaction to the requirements of these Specifications. The maximum particle size shall not be more than two-thirds of the compacted layer thickness.

Ordinarily, only the materials satisfying the density requirements as per specifications shall be employed for the construction of the embankment and the subgrade.

Table-2.1. Density Requirements of Embankment and Subgrade Materials

| S.No. | Type of Work | Maximum laboratory dry unit weight when tested as per IS: 2270 (Part 8) |
|---|---|---|
| 1. | Embankments up to 3 metres height, not subjected to extensive flooding. | Not less than 15.2 kN/cum. |
| 2. | Embankments exceeding 3 metres height or embankments of any height subject to long periods of inundation | Not less than 16.0 kN/cum. |
| 3. | Sub grades and earthen shoulders / verges / backfill | Not less than 17.5 kN/cum. |

Notes:
This Table is not applicable for lightweight fill material e.g. cinder, fly ash etc.
The Engineer may relax these requirements at his discretion taking into account the availability of materials for construction and other relevant factors.
The material to be used in subgrade should also satisfy design CBR at the dry unit weight applicable as specified .

**2.7.3 General requirements of materials**

The work shall be so planned and executed that the best available materials are saved for the subgrade and the embankment portion just below the subgrade.

**Borrow Materials**

Where the materials are to be obtained from designated borrow areas, the location, size and shape of these areas shall be as indicated by the Engineer and the same shall not be opened without his written permission. Where specific borrow areas are not designated by the Employer / the Engineer, arrangement for locating the source of supply of material for embankment and subgrade as well as compliance to environmental requirements in respect of excavation and borrow areas as stipulated, from time to time by

the Ministry of Environment and Forests, Government of India and the local bodies, as applicable, shall be the sole responsibility of the Contractor.

Borrow pits along the road shall be discouraged. If permitted by the Engineer, these shall not be dug continuously. Ridges of not less than 8 m width should be left at intervals not exceeding 300 m. Small drains shall be cut through the ridges to facilitate drainage. The depth of the pits shall be so regulated that their bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of the bank, the maximum depth in any case being limited to 1.5 m. Also, no pit shall be dug within the offset width from the toe of the embankment required as per the consideration of stability with a minimum width of 10 m. Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction plants is operating at the place of deposition.

No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Should the Contractor be permitted to remove acceptable material from the site to suit his operational procedure, then he shall make good any consequent deficit of material arising there from.

Where the excavation reveals a combination of acceptable and unacceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the unacceptable materials. The acceptable materials shall be stockpiled separately.

The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants or siting of temporary buildings or structures.

The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing programme approved by the Engineer. It shall be ensured that the subgrade material when compacted to the density requirements as in Table 2.2 shall yield the design CBR value of the subgrade.

Table-2.2 . Compaction Requirements for Embankment and Subgrade

| S | Type of work/ material | Relative compaction as percentage of |
|---|---|---|

| r | | max. laboratory dry density as per IS: 2720 (Part 8) |
|---|---|---|
| 1. | Subgrade and earthen shoulders | Not less than 97 |
| 2. | Embankment | Not less than 95 |
| 3. | Expansive Clays | |
| | a) Subgrade and 500 mm portion just below the subgrade | Not allowed |
| | b) Remaining portion of embankment | Not less than 90 |

The Contractor shall at least 7 working days before commencement of compaction submit the following to the Engineer for approval:

The values of maximum dry density and optimum moisture content obtained in accordance with IS: 2720 (Part 7) or (Part 8), as the case may be, appropriate for each of the fill materials he intends to use.
A graph of density plotted against moisture content from which each of the values in (1) above of maximum dry density and optimum moisture content were determined.
The Dry density-moisture content-CBR relationships for light, intermediate and heavy compactive efforts (light corresponding to IS: 2720 (Part 7), heavy corresponding to IS: 2720 (Part 8) and intermediate in-between the two) for each of the fill materials he intends to use in the subgrade.

Once the above information has been approved by the Engineer, it shall from the basis for compaction.

### 2.7.4 Construction Operations for Embankments / Subgrade

**Setting out**

After the site has been cleared, the work shall be set out. The limits of embankment/subgrade shall be marked by fixing batter pegs on both sides at regular intervals as guides before commencing the earthwork. The embankment / subgrade shall be built sufficiently wider than the design dimension so that surplus materials may be trimmed, ensuring that the remaining material is to the desired density and in position specified and conforms to the specified side slopes.
**Dewatering**

If the foundation of the embankment is in an area with stagnant water, and in the opinion of the Engineer it is feasible to remove it, the same shall be removed by bailing out or pumping, as directed by the Engineer and the area of the embankment foundation shall be kept dry. Care shall be taken to discharge the drained water so as not to cause damage to the works, crops or any other property. Due to any negligence on the part of the Contractor, if any such damage is caused, it shall be the sole responsibility of the Contractor to repair / restore it to original condition or compensate the damage at his own cost.

**Stripping and Storing topsoil**

In localities where most of the available embankment materials are not conducive to plant growth, or when so directed by the Engineer, the topsoil from all areas of cutting and from all areas to be covered by embankment foundation shall be stripped to specified depths not exceeding 150 mm and stored in stockpiles of height not exceeding 2 m for covering embankment slopes, cut slopes and other disturbed areas where re-vegetation is desired. Topsoil shall not be unnecessarily trafficked either before stripping or when in a stockpile. Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum.

**Compacting ground supporting Embankment / Subgrade**

When necessary, the original ground shall be levelled to facilitate placement of first layer of embankment, scarified, mixed with water and then compacted by rolling so as to achieve minimum dry density.

In case where the difference between the subgrade level (top of the subgrade on which pavement rests) and ground level is less than 0.5 m and the ground does not have 97 percent relative compaction with respect to the dry density, the ground shall be loosened up to a level 0.5 m below the subgrade level, watered and compacted in layers in accordance not less than 97 percent of dry density.

Where so directed by the Engineer, any unsuitable material occurring in the embankment foundation shall be removed and replaced by approved materials laid in layers to the required degree of compaction.

Embankment or subgrade work shall not proceed until the foundations of embankments/subgrade have been inspected by the Engineer for satisfactory condition and approved.

Any foundation treatment specified for embankments especially high embankments, resting on suspect foundations as revealed buy borehole logs shall be carried out in a manner and to the depth as desired by the Engineer. Where the ground on which and embankment is to be built has any of the material types as specified, at least 500 mm of such material must be removed and replaced by acceptable fill material before embankment construction commences.

**Spreading material in layers and bringing to appropriate moisture content**

The embankment and subgrade material shall be spread in layers of uniform thickness not exceeding 200 mm compacted thickness over the entire width of embankment by mechanical means, finished by a motor grader and compacted. The motor grader blade shall have hydraulic control suitable for initial adjustment and maintain the same so as to achieve the specific slope and grade. Successive layers shall not be placed until the layer under construction has been thoroughly compacted and got approved by the Engineer. Each compacted layer shall be finished parallel to the final cross-section of the embankment.

Moisture content of the material shall be checked at the site of placement prior to commencement of compaction; if found to be out of agreed limits, the same shall be made good. Where water is required to be added in such construction, water shall be sprinkled from a water tanker fitted with sprinkler capable of applying water uniformly with a controllable rate of flow to variable widths of surfaces but without any flooding. The water shall be added uniformly and thoroughly mixed in soil by blading, discing or harrowing until and uniform moisture content is obtained throughout the depth of the layer.

If the material delivered to the roadbed is too wet, it shall be dried, by aeration and exposure to the sun, till the; moisture content is acceptable for compaction. Should circumstances arise, where owing to wet weather, the moisture content cannot be reduced to the required amount by the above procedure, compaction work shall be suspended.

Moisture content of each layer of soil shall be checked in accordance with IS: 2720 (Part 2), and unless otherwise mentioned, shall be so adjusted, making due allowance for evaporation losses, that at the time of compaction it is in the range of 1% above to 2% below the optimum moisture content determined in accordance with IS: 2720 (Part 7) or IS: 2720 (Part 8) as the case may be. Expansive clays shall, however, be compacted at moisture content corresponding to the specified dry density, but on the wet side of the optimum moisture content obtained from the laboratory compaction curve.

After adding the required amount of water, the soil shall be processed by means of graders, harrows, rotary mixers or as otherwise approved by the Engineer unit the layer is uniformly wet.

Clods or hard lumps of earth shall be broken to have a maximum size of 75 mm when being placed in the embankment and a maximum size of 50 mm when being placed in the subgrade.

Embankment and other areas of fill shall, unless otherwise required in the Contract or permitted by the Engineer, be constructed evenly over their full width and their fullest possible extent and the Contractor shall control and direct construction plant and other vehicular traffic uniformly over them. Damage by construction plant and other vehicular traffic shall be made good by the Contractor with material having the same characteristics and strength as the material had before it was damaged.

Embankments and other areas of unsupported fills shall not be constructed with steeper side slopes, or to greater widths than those shown in the Contract, except to permit adequate compaction at the edges before trimming back, or to obtain the final profile following any settlement of the fill and the underlying material.

Whenever fill is to be deposited against the face of a natural slope, or sloping earthworks face including embankments, cuttings, other fills and excavations steeper than 1 vertical on 4 horizontal, such faces shall be benched immediately before placing the subsequent fill.

All permanent faces of side slopes of embankments and other areas of fill formed shall, subsequent to any trimming operations, be reworked and sealed to the satisfaction of the Engineer by tracking a tracked vehicle, considered suitable by the Engineer, on the slope or any other method approved by the Engineer.

**(a) Compaction**

Only the compaction equipment approved by the Engineer shall be employed to compact the different material types encountered during construction. Smooth wheeled, vibratory, pneumatic tyred, sheepfoot or pad foot rollers, etc., of suitable size and capacity as approved by the Engineer shall be used for the different types and grades of materials required to be compacted either individually or in suitable combinations.

The compaction shall be done with the help of vibratory roller of 80 to 100 kN static weight with plain or pad foot drum or heavy pneumatic tyred roller of adequate capacity capable of achieving required compaction.

The Contractor shall demonstrate the efficiency of the equipment he intends to use by carrying out compaction trials. The procedure to be adopted for these site trials shall first be submitted to the Engineer for approval.

Earthmoving plant shall not be accepted as compaction equipment nor shall the use of a lighter category of plant to provide any preliminary compaction to assist the use of heavier plant be taken into account.

Each layer of the material shall be thoroughly compacted. Subsequent layers shall be placed only after the finished layer has been tested according to Clause 903.2.2 of MoST Specifications for Roads and Bridge Works (IV Revision) and accepted by the Engineer. The Engineer may permit measurement of field dry density by a nuclear moisture / density gauge used in accordance with agreed procedure and the gauge is calibrated to provide results identified to that obtained from tests in accordance with IS: 2720 (Part 28). A record of the same shall be maintained by the Contractor.

When density measurement reveal any soft areas in the embankment / subgrade / earthen shoulders, further compaction shall be carried out as directed by the Engineer. If in spite of that the specified compaction is not achieved, the material in the soft areas shall be removed and replaced by approved material, compacted to the density requirements and satisfaction of the Engineer.

**(b) Drainage**

The surface of the embankment / subgrade at all times during construction shall be maintained at such a cross fall (not flatter than that required for

effective drainage of an earthen surface) as will shed water and prevent ponding.

**(c) Repairing of damages caused by rain / spillage of water**

The soil in the affected portion shall be removed in such areas as directed by the Engineer before next layer is laid and refilled in layers and compacted using appropriate mechanical means such as small vibratory roller, plate compactor or power rammer to achieve the required density. If the cut is not sufficiently wide for use of required mechanical means for compaction, the same shall be widened suitably to permit their use for proper compaction. Tests shall be carried out as directed by the Engineer to ascertain the density requirements of the repaired area. The work of repairing the damages including widening of the cut, if any, shall be carried out by the Contractor at his own cost, including the arranging of machinery / equipment for the purpose.

**(d) Finishing operations**

Finishing operations shall include the work of shaping and dressing the shoulders / verge / roadbed and side slopes to conform to the alignment, levels, cross-sections and dimensions shown on the Drawings or a directed by the Engineer subject to the surface tolerance described in Clause 902 of MoST Specifications for Roads and Bridge Works (IV Revision). Both the upper and lower ends of the side slopes shall be rounded off to improve appearance and to merge the embankment with the adjacent terrain.

The topsoil, removed and conserved earlier shall be spread over the fill slopes as per directions of the Engineer to facilitate the growth of vegetation. Slopes shall be roughened and moistened slightly prior to the application of the topsoil in order to provide satisfactory bond. The depth of the topsoil shall be sufficient to sustain plant growth, the usual thickness being from 75 mm to 150 mm.

Where directed, the slopes shall be turfed with sods. If seeding and mulching of slopes is prescribed, this shall be as directed.

When earthwork operations have been substantially completed, the road area shall be cleared of all debris, and ugly scars in the construction area responsible for objectionable appearance eliminated.

### 2.7.5 Construction of Embankment and Subgrade under Special Conditions

#### (e) Earthwork for widening existing road embankment

When an existing embankment and / or subgrade is to be widened and its slope are steeper than 1 vertical on 4 horizontal, continuous horizontal benches, each at least 300 mm wide, shall be cut into the old slope for ensuring adequate bond with the fresh embankment / subgrade material to be added. The material obtained from cutting of benches could be utilized in the widening of the embankment / subgrade. However, when the existing slope against which the fresh material is to be placed is flatter than 1 vertical on 4 horizontal, the slope surface may only be ploughed or scarified instead of resorting to benching.

Where the width of the widened portions is insufficient to permit the use of conventional rollers, compaction shall be carried out with the help of small vibratory rollers / plate compactors / power rammers of any other appropriate equipment approved by the Engineer. End dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other types of hauling equipment.

#### (f) Earthwork for embankment and subgrade to be placed against sloping ground

Where an embankment / subgrade is to be placed against sloping ground, the latter shall be appropriately benched or ploughed / scarified before placing the embankment / subgrade material. Extra earthwork involved in benching or due to ploughing / scarifying etc. shall be considered incidental to the work.

For wet conditions, benches with slightly inward fall subsoil drains at the lowest point shall be provided as per the Drawings, before the fill is placed against sloping ground.

#### (g) Earthwork over existing road surface

Where the embankment is to be placed over an existing road surface, the work shall be carried out as indicated below:

If the existing road surface is of granular or bituminous type and lies within

1 m of the new subgrade level, the same shall be scarified to a depth of 50 mm or more if specified, so as to provide ample bond between the old and new material ensuring that at least 500 mm portion below the top of new subgrade level is compacted to the desired density.

If the existing road surface is of cement concrete type and lies within 1 m of the new subgrade level the same shall be removed completely.

If the level difference between the existing road surface and the new formation level is more than 1 m, the existing surface shall be permitted to stay in place without any modification.

## (h) Embankment and sub grade around structures

To avoid interference with the construction of abutments, wing walls or return walls of culvert / bridge structures, the Contractor shall, at points to be determined by the Engineer suspend work on embankment forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of damage to the structure.
Unless directed otherwise, the filling around culverts, bridges and other structures up to a distance of twice the height of the road from the back of the abutment shall be carried out independent of the work on the main embankment. The fill material shall not be placed against any abutment or wing wall, unless permission has been given by the Engineer but in any case not until the concrete or masonry has been in position for 14 days. The embankment and subgrade shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer.

The material used for backfill shall not be an organic soil or highly plastic clay having plasticity index and liquid limit more than 20 and 40 respectively when tested according to IS: 2720 (Part 5). Filling behind abutments and wing walls for all structures shall conform to the general guidelines given in Appendix 6 of IRC:78 (Standard Specifications and Code of Practice for Road Bridges-Section VII) in respect of the type of material, the extent of backfill, its laying and compaction etc. The fill material shall be deposited in horizontal layers in loose thickness and compacted thoroughly.

Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill

material. The material used for filter shall conform to the requirements for filter medium spelt out in Clause 2502 of MoST Specifications for Roads and Bridge Works (IV Revision) unless otherwise specified in the Contract.

Where it may be impracticable to use conventional rollers, the compaction shall be carried out by appropriate mechanical means such as small vibratory roller, plate compactor or power rammer. Care shall be taken to see that the compaction equipment does not hit or come too close to any structural member so as to cause any damage to them or excessive pressure against the structure.

**(i) Construction of Embankment over Ground Incapable of Supporting Construction Equipment**

Where embankment is to be constructed across ground which will not support the weight of repeated heavy loads of construction equipment, the first layer of the fill may be constructed by placing successive loads of material in a uniformly distributed layer of a minimum thickness required to support the construction equipment as permitted by the Engineer. The Contractor, if so desired by him, may also use suitable geosynthetic material to increase the bearing capacity of the foundation. This exception to normal procedure will not be permitted where, in the opinion of the Engineer, the embankments could be constructed in the approved manner over such ground by the use of lighter or modified equipment after proper ditching and drainage have been provided. Where this exception is permitted, the selection of the material and the construction procedure to obtain an acceptable layer shall be the responsibility of the Contractor. The cost of providing suitable traffic conditions for construction equipment over any area of the Contract will be the responsibility of the Contractor and no extra payment will be made to him.

**(j) Embankment construction under water**

Where filling or backfilling is to be placed under water, only acceptable granular material or rock shall be used unless otherwise approved by the Engineer. Acceptable granular material shall consist of graded, hard durable particles with maximum particle size not exceeding 75 mm. The material should be non-plastic having uniformity coefficient of not less than 10. The material placed in open water shall be deposited by end tipping without compaction.

**(k) Earthwork for high embankment**

In the case of high embankments, the Contractor shall normally use the material from the specified borrow area. In case he desires to use different material for his own convenience, he shall have to carry out necessary soil investigations and redesign the high embankment at his own cost. The Contractor shall then furnish the soil test data and design of high embankment for approval of the Engineer, who reserve the right to accept or reject it.

If necessary, stage construction of fills and any controlled rates of filling shall be carried out in accordance with the Contract including installation of instruments and it's monitoring.

Where required, the Contractor shall surcharge embankments or other areas of till with approved material for the periods specified in the Contract. If settlement of surcharged fill results in any surcharging material, which is unacceptable for use in the fill being surcharged, lying below formation level, the Contractor shall remove the unacceptable material and dispose it as per direction of the Engineer. He shall then bring the resultant level up to formation level with acceptable material.

**(l) Settlement period**

Where settlement period is specified in the Contract, the embankment shall remain in place for the required settlement period before excavating for abutment, wing wall, retaining wall, footings, etc., or driving foundation piles. The duration of the required settlement period at each location shall be as provided for in the Contract or as directed by the Engineer.

### 2.7.6 Plying of Traffic

Construction and other vehicular traffic shall not use the prepared surface of the embankment and / or subgrade without the prior permission of the Engineer. Any damage arising out of such use shall, however, be made good by the Contractor at his own expense as directed by the Engineer.

### 2.7.7 Surface Finish and Quality Control of Work

The surface finish of construction of subgrade shall conform to the requirements of Clause 902 of MoST Specifications for Roads and Bridge Works (IV Revision). Control on the quality of materials and works shall be exercised in accordance with Clause 903 of MoST Specifications for Roads and Bridge Works (IV Revision).

### 2.7.8 Subgrade Strength

It shall be ensured prior to actual execution that the borrow area material to be used in the subgrade satisfies the requirements of design CBR.

Subgrade shall be compacted and finished to the design strength consistent with other physical requirements. The actual laboratory CBR values of constructed subgrade shall be determined on undisturbed samples cut out from the compacted subgrade in CBR mould fitted with cutting shoe or on remoulded samples, compacted to the field density at the field moisture content.

### 2.7.9 Measurements for Payment

(m) Earth embankment/subgrade construction shall be measured separately by taking cross sections at intervals in the original position before the work starts and after its completion and computing the volumes of earthwork in cubic meters by the method of average end areas.

(n) The measurement of fill material from borrow areas shall be the difference between the net quantities of compacted fill and the net quantities of suitable material brought from roadway and drainage excavation. For this purpose, it shall be assumed that one cum. of suitable material brought to site from road and drainage excavation forms one cum. of compared fill and all bulking or shrinkage shall be ignored. Construction of embankment under water shall be measured in cum. Construction of high embankment with specified material and in specified manner shall be measured in cum.

(o) Stripping including storing and reapplication of topsoil shall be measured in cum. Work involving loosening and recompacting of ground supporting embankment / subgrade shall be measured in cum. Removal of unsuitable material at embankment / subgrade foundation and replacement with suitable material shall be measured in cum. Scarifying existing granular / bituminous road surface shall be measured in square metres. Dismantling and removal of existing cement concrete pavement shall measure vide Clause 202.6 of MoST Specifications for Roads and Bridge Works (IV Revision).

**2.7.10 Rates**

(p) The Contract unit rates for the items of embankment and subgrade construction shall be payment in full for carrying out the required operations including full compensation for:

Cost of arrangement of land as a source of supply of material of required quantity for construction unless provided otherwise in the Contract;
Setting out;
Compacting ground supporting embankment / subgrade except where removal and replacement of unsuitable material or loosening and recompacting is involved;
Scarifying or cutting continuous horizontal benches 300 mm wide on side slopes of existing embankment and subgrade as applicable;
Cost of watering or drying of material in borrow areas and / or embankment and subgrade during construction as required.
Spreading in layers bringing to appropriate moisture content and compacting to Specification requirements;
Shaping and dressing top and slopes of the embankment and subgrade including rounding of corners;
Restricted working at sites of structures;
Working on narrow width of embankment and subgrade;
Excavation in all soils from borrow pits / designated borrow areas including clearing and grubbing and transporting the material to embankment and subgrade site with all lifts and leads unless otherwise provided for in the Contract;
All labour, materials, tools, equipment and incidentals necessary to complete the work to the Specifications;
Dewatering; and
Keeping the embankment / completed formation free of water.
In case the Contract unit rate specified is not inclusive of all leads, the unit rate for transporting material beyond the initial lead, as specified in the Contract for construction of embankment and subgrade shall be inclusive of

full compensation for all labour, equipment, tools and incidentals necessary on account of the additional haul or transportation involved beyond the specified initial lead.

The Contract unit rate for the items of stripping and storing topsoil and of reapplication of topsoil shall include full compensation for all the necessary operations including all lifts, but leads up to 1000 m.

The contract unit rate for loosening and recompacting the loosened materials at subgrade shall include full compensation for loosening to the specified depth, including breaking clods, spreading in layers, watering where necessary and compacting to the requirements.

The Contract unit rate for scarifying existing granular / bituminous road surface shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment and incidentals necessary to complete the work. This will also comprise of handling, salvaging, stacking and disposing of the dismantled materials within all lifts and up to a lead of 1000 m or as otherwise specified.

Clause 202.7 of MoST Specifications for Roads and Bridge Works (IV Revision) shall apply as regards Contract unit rate for dismantling and removal of existing cement concrete pavement.

The Contract unit rate for providing and laying filters material behind abutments shall be payment in full for carrying out the required operations including all materials, labour, tools, equipment and incidentals to complete the work to Specifications.

(q)

**End of Part 2**

# CHAPTER 3

# ROADS

## 5 Definitions

The words like Contract, Contractor, Engineer (synonymous with Engineer-in-charge),Drawings, Employer, Government, Works and Work Site used in these Specifications shall be considered to have the meaning as understood from the definitions of these terms given in the General Conditions of Contract.

The following abbreviations shall have the meaning as set forth below:

| | | |
|---|---|---|
| MORTH | : | Ministry of Road Transport and Highways (Revision V) |
| IRC | : | Indian Roads Congress |
| IS | : | Indian Standard published by the Bureau of Indian Standards |
| GSB | : | Granular Sub Base |
| WMM | : | Wet Mix Macadam |
| BM | : | Bituminous Macadam |
| BC | : | Bituminous Concrete |
| CBR | : | California Bearing Ratio |
| AASHTO | : | American Association of State Highway and Transportation Officials |
| ASTM | : | American Society for Testing and Materials |
| BS | : | British Standard published by the British Standards Institution |

The various elements in the cross-section of a road referred to in these Specifications are shown in the cross-sections in Fig. 3-1.

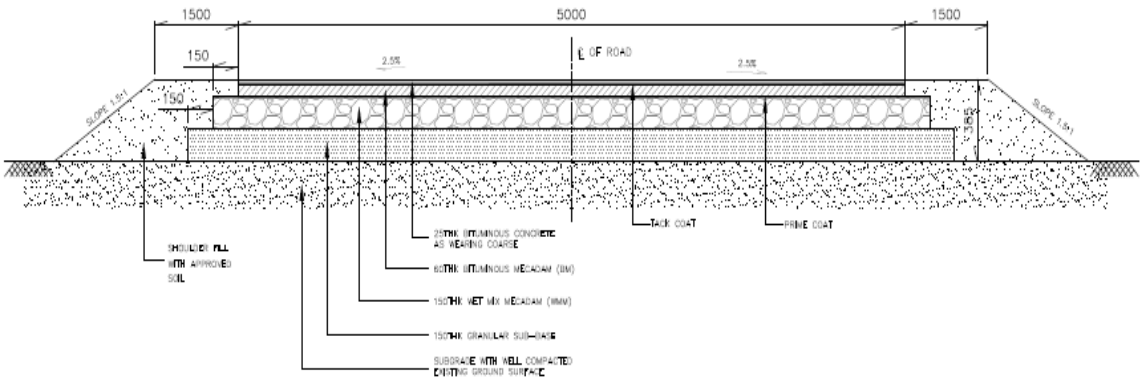


**Fig. 3-1: Proposed Typical Cross Section of the Road**

## 5.1 Applicable Codes and Specifications

The following specifications, standards and codes are referred to in this part.

IS : 460 : Specification for Test sieves
(Parts 1 to 3)

IS : 1077 : Common burnt clay building bricks - Specification

IS : 1124 : Method of test for determination of water absorption, apparent specific gravity and porosity of natural building Aggregates / stones

IS : 1195 : Specification for Bitumen Mastic for Flooring

IS : 1196 : Code of Practice for Laying Bitumen Mastic Flooring

IS : 1834 : Specification for Hot Applied Sealing Compounds for Joints in Concrete

IS : 2386 : Methods of test for aggregates for concrete
(Parts 1 to 8)

IS : 2720 : Method of Test for Soils for determination of Liquid and plastic limit.
(Part 5)

IS : 6241 : Method of test for determination of stripping value of road aggregates.

IRC : 16 : Specification for priming of Base Course with Bituminous Primers.

IRC : 17 : Tentative specification for Single Coat Bituminous Surface Dressing

IRC : 19 : Standard specifications and code of practice for water bound macadam

IRC : 29 : Specification for bituminous concrete (Asphaltic Concrete)
for road pavement.

MORTH
Specifications : Ministry of Road Transport and Highways Specifications for Road and Bridge works

Section-100 : General

Section-300 : Earthwork

Section-401 : Granular sub base

Section-406 : Wet mix macadam

Section-504 : Bituminous macadam

Section-507 : Bituminous concrete

## 5.2 Road Configuration

The roads shall be installed in layers as per drawing and specifications as per concerned sections of MORTH.

Technical specification:

a) Subgrade

b) Granular Sub base as per section 401 of MORTH specification.

c) Wet mix macadam (WMM) as per section 406 of MORTH specification.

d) Bituminous macadam (BM) as per section 504 of MORTH specification.

e) Bituminous concrete (BC) as per section 507 of MORTH specification.

## 5.3 Materials

### 5.3.1 General

All materials shall be obtained from local sources and shall conform to technical specifications and be subject to Engineer's approval prior to use.

### 5.3.2 Sub grade

The materials used in sub grades shall be the existing natural soil approved by the Engineer and as per specifications. Such material shall be free of logs, stumps, roots, rubbish or any other ingredient likely to deteriorate affect the stability of the subgrade.

The Contractor shall carry out the excavation in such a manner that the acceptable materials are excavated separately for use in backfill/restoration works without contamination by the unacceptable materials. The acceptable materials shall be stockpiled separately.

It shall be ensured that the subgrade material when compacted to the density requirements as in Table 3.1 (As perTable 300-2 of MORTH specification) shall yield the design CBR value of the subgrade.

**Table 3.1: Compaction requirement for Subgrade**

(As per Table 300-2 of MORTH Specification)

| **Type of work/material** | | **Relative compaction as % of max. lab dry density as per IS: 2720 (Part 8)** |
|---|---|---|
| 1 | Subgrade and earthen shoulders | Not less than 97 |

The Contractor shall at least 7 working days before commencement of compaction submit the following to the Engineer for approval:

i) The values of Maximum Dry Density and Optimum Moisture Content obtained in accordance with IS: 2720 (Part 8) appropriate for each of the fill materials he intends to use.
ii) A graph of density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined.
iii) The Dry density-moisture content - CBR relationships for light, intermediate and heavy compactive efforts (light corresponding to IS: 2720 (Part 7), heavy corresponding to IS: 2720 (Part 8) and intermediate in-between the two) for each of the fill materials he intends to use in the subgrade.

Once the above information has been approved by the Engineer, it shall form the basis for compaction.

### 5.3.3 Granular Sub Base

The material to be used for the work shall be natural sand, murum, gravel, crushed stone, or combination thereof depending upon the grading required. Materials like crushed slag crushed concrete, brick metal and kankar may be allowed only with the specific approval of the Engineer. The material shall be free from organic or other deleterious constituents and conform to grading-iii given in Table 3.2: Gradation for coarse graded granular Sub base.(As perTable 400-1 of MORTH Specifications).

The CBR shall be determined at the density and moisture content likely to be developed in
equilibrium conditions, which shall be taken as being the density relating to a uniform air, voids
content of 5 per cent.

**Table 3.2: Gradation for coarse graded granular Sub base.**
(As per TABLE 400–1 of MORTH Specification)

| **IS Sieve** | **Percent by weight passing the IS Sieve** | | |
|---|---|---|---|
| **Designation** | **Grading I** | **Grading II** | **Grading III** |
| 75.0 mm | 100 | - | - |
| 53.0 mm | 80-100 | 100 | 100 |
| 26.5 mm | 55 - 90 | 70-100 | 55-75 |
| 9.50 mm | 35-65 | 50-80 | - |
| 4.75 mm | 25-55 | 40-65 | 10-30 |
| 2.36 mm | 20-40 | 30-50 | - |

| | | | |
|---|---|---|---|
| 0.425 mm | 10-15 | 10-15 | - |
| 0.075 mm | <5 | <5 | <5 |
| CBR Value(Minimum) | 30 | 25 | 20 |

Note : The material passing 425 micron (0.425 mm) sieve for all the three gradings when tested according to IS : 2720 (Part 5) shall have liquid limit and plasticity index not more than 25 and 6 per cent respectively.

### 5.3.4 Coarse Aggregates

Coarse aggregate, stone chippings shall consist of natural or crushed stone, clean, hard, tough, durable and free from excess of flat, elongated, soft and disintegrated particles, dirt, salt, alkali, vegetable matter, adherent coatings, organic and other objectionable matter, and shall conform to the physical requirements given in Table 3.3 and Table 3.4 hereunder, as applicable. Aggregate for bituminous wearing courses shall in addition have good hydrophobic properties i.e. capacity of retaining the film of bituminous material applied to the stone in all weather conditions and especially in wet conditions. Basalt, dolerites are good in this respect; granite, quartzites are comparatively poor.

**Table – 3.3: Physical Requirements of Coarse Aggregate for Wet Mix Macadam (WMM)**

| Sl. No | Test | Requirements | Test Method |
|---|---|---|---|
| 1. | Los Angeles Abrasion Value<br>Or<br>Aggregate Impact Value | 40 percent (max.)<br><br>30 percent (max.) | IS:2386 (Part – IV)<br><br>IS:2386 (Part – IV)<br>Or<br>IS:5640 |
| 2. | Combined Flakiness and Elongation Indices(Total) | 35 percent (max.)* | IS:2386 (Part I) |

(*) To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the

elongated particles be separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The values of flakiness index and elongation index so found are added up.

Table – 3.4: Physical Requirements of Coarse Aggregates for Dense Bituminous macadam (BM) (As per Table 500-8 of MORTH Specification)

| **Sl. No.** | **Property** | **Test** | **Requirements** | **Test Method** |
|---|---|---|---|---|
| 1. | Strength | Los Angeles Abrasion Value<br>Or<br>Aggregate Impact Value | 35 percent (max.)<br><br>27 percent (max.) | IS:2386 (Part – IV) |
| 2. | Particle shape | Combined Flakiness and Elongation Indices * | 35 percent (max.) | IS:2386 (Part I) |
| 3. | Stripping | Coating and Stripping of Bitumen Aggregate Mix | Min. Retained coating 95% | IS:6241 |
| 4. | Water Absorption | Water Absorption | 2 percent (max.) | IS:2386 (Part-III) |
| 5.<br><br><br><br><br>6.<br><br>7. | Durability<br><br><br><br><br>Cleanliness (dust)<br><br>Water sensitivity | Soundness<br>Loss with Sodium Sulphate – 5 cycles<br>Loss with Magnesium Sulphate – 5 cycles<br>Grain size analyis<br><br>Retained Tensile Strength** | 12 percent (max.)<br><br>18 percent (max.)<br><br>Max 5% passing 0.075mm sieve<br>Min. 80% | IS:2386 (Part-V)<br><br><br>IS:2386 (Part I)<br><br>AASHTO 283 |

(*) To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total

non-flaky particles. The values of flakiness index and elongation index so found are added up.

(**) If the minimum retained tensile test strength falls below 80 percent, use of anti-stripping agent is recommended to meet the requirement.

### 5.3.5 Murum/Kankar/Gravel

Murum shall contain low plasticity binder material mixed with hard granular particles such as sand and/or gravel. Murum shall be sound and hard of a quality not affected by weather, to be screened at the quarry and free from all impurities. Large lumps shall all be broken at the quarry and murum delivered at site must pass in every direction through a 63 mm ring. Murum shall not contain more than 5% to 8% of fines passing a 75 micron sieve.

Gravel shall be composed of large, coarse, silicious grains, sharp and gritty to the touch, thoroughly free from dirt, organic and deleterious matter. It shall be hard, tough, dense and shall not contain particles bigger than 12 mm and more than 10 percent silt.

### 5.3.6 Sand / Stone Dust

The sand / Stone dust shall consist of clean, hard, strong and durable pieces of crushed stone, crushed gravel, or a suitable combination of natural sand, crushed stone or gravel. They shall not contain dust, lumps, soft or flaky, materials, mica or other deleterious materials in such quantities as to reduce the strength and durability of the concrete, or to attack the embedded steel. Motorized sand washing machines should be used to remove impurities from sand. Fine aggregate having positive alkali-silica reaction shall not be used. All fine aggregates shall conform to IS: 383 and tests for conformity shall be carried out as per IS: 2386, (Parts I to VIII). The Contractor shall submit to the Engineer the entire information indicated in Appendix A of IS: 383. The fineness modulus of fine aggregate shall neither be less than 2.0 nor greater than 3.5. The Sand used shall be coarse, sharp, gritty, clean, granular material. Only material passing through 4.75 mm sieve and retained on 75 micron sieve shall be used. The sand / Stone dust / fine aggregates shall conform to grading requirement in Table 3.5

Table 3.5: Gradation requirement of Sand / Fine aggregates
(As per Table 1000-2 of MORTH Specifications)

| IS Sieve Size | Per cent by Weight Passing the Sieve |
|---|---|

| | Zone I | Zone II | Zone III |
|---|---|---|---|
| 10 mm | 100 | 100 | 100 |
| 4.75 mm | 90-100 | 90-100 | 90-100 |
| 2.36 mm | 60-95 | 75-100 | 85-100 |
| 1.18 mm | 30-70 | 55-90 | 75-100 |
| 600 micron | 15-34 | 35-59 | 60-79 |
| 300 micron | 5-20 | 8-30 | 12-40 |
| 150 micron | 0-10 | 0-10 | 0-10 |

Note: When the grading falls outside the limits of any particular grading zone of sieves other than 600-micron IS Sieve by a total amount not exceeding 5 percent, it shall be regarded as falling within that grading zone. However for crushed stone sand, the permissible limit on 150-micron IS Sieve is increased to 20 percent. Reference shall be made to clause: 4.3 of IS: 383.

### 5.3.7 Bituminous Materials

Bituminous materials shall conform to IS: 73, IS: 215, IS: 217 or IS: 454 as applicable and be of the grade specified.

**Table 3.6: Physical requirements of Coarse aggregates for Bituminous concrete (BC).**
**(As per TABLE 500-16: MORTH specifications)**

| **PROPERTY** | **TEST** | **SPECIFICATION** | **METHOD OF TEST** |
|---|---|---|---|
| Cleanliness (dust) | Grain size analysis | Max 5% passing 0.075 mm sieve. | IS: 2386 Part I |
| Particle shape | Flakiness and Elongation Index | Max 35% (Combined)2 | IS: 2386 Part I |
| Strength | Los Angles Abrasion Value or Aggregate Impact Value | Max 30%<br>Max 24% | IS: 2386 Part IV |
| Polishing | Polished Stone Value | Min 55 | BS: 812-114 |
| Durability | Soundness:<br>Sodium Sulphate or Magnesium Sulphate | <br>Max 12%<br>Max 18% | IS: 2386 Part V |
| Water Absorption | Water absorption | Max 2% | IS: 2386 Part III |

| | | | |
|---|---|---|---|
| Stripping | Coating and Stripping of Bitumen Aggregate Mixtures | Minimum retained coating 95%. | IS: 6241 |
| Water Sensitivity | Retained Tensile Strength* | Min 80% | AASHTO 283 |

* If the minimum retained Tensile strength test falls below 80%, use of anti-stripping agent is recommended to meet the requirement.

## 5.4 Earth work

### 5.4.1 Earthwork in Excavation

Profiles of road excavation shall be laid at 50 m intervals or as specified in Drawings to conform to the required alignment, sections, grades and side slopes and the lines of cuts shall be clearly marked.

Contractor shall on no account excavate beyond the slopes or below the specified grade unless so approved by the Engineer in writing. If excavation is done below the specified level or outside the section the Contractor shall be required to fill up with approved materials, in layers of 150 to 200 mm, watered and compacted as specified for the subgrade.

The excavation shall be finished neatly, smoothly and evenly to the correct lines, grades, sections as shown in the drawings or approved by Engineer.

### 5.4.2 Earthwork in Subgrade

The Subgrade shall be formed of existing natural soil. Profiles of subgrade shall be set up with stout poles to mark the centre and edges of the formation with the top levels of formation clearly marked by paint or cut and the slopes with strings and pegs at every 10 metres on straight portions.

Subgrade material shall be placed in successive horizontal layers of 200 mm depth extending to the full width of the Subgrade / trench to allow compaction of the full specified section to 150 mm using mini rollers / tampers / plate vibrators till the soil is evenly compacted to 95% of Proctor density with 2% variation in optimum moisture content. Before placing the next layer of 200 mm the surface of the underlayer shall be moistured and scarified with pick axes or spades to provide a satisfactory bond with the next layer. The next layer shall also be compacted to 150 mm

to the full width of the trench section till the soil is evenly compacted to 95% of Proctor density with 2% variation in optimum moisture content.

When boulders, broken stones and similar hard materials are mixed up with the embankment materials care shall be taken to see that they are distributed uniformly into the bank and that no hollows are left near them. No stone or hard material shall project above the top of any layer. Each layer of embankment shall be watered, levelled, and compacted as specified before the succeeding layer is placed. The surface of the embankment shall at all times during construction be maintained at such a cross fall as will shed water and prevent ponding.

If the soil contains less than the optimum moisture, water shall be added to the loose layers of the subgrade to bring the moisture uniformly upto requirement. If the material contains more than the required moisture it shall be allowed to dry until the moisture is reduced to the required extent. The moistured/dried loose layers shall be compacted with a vibratory roller / mini roller / plate vibrator/ tampers to achieve the desired compaction level of 95% of Proctor density.

### 5.5 Compaction with Sand / stone dust

In order to achieve better compaction and a compacted surface before laying the GSB layer, two layers of sand / stone dust shall be laid and compacted to 150 mm each.

### 5.6 Preparation of Granular Sub-base (GSB)

**Spreading and Compacting:**
The granular sub base material of grade-iii as specified in Table 3.2: Gradation for coarse graded granular Sub base (As per Table 400–1 of MORTH Specifications) shall be spread on the prepared sub grade maintaining the required slope and grade during the operation or other means as approved by the Engineer or as per applicable MORTH Specifications. The work shall be done as per Clause 401 MORTH V revision and as per BOQ provisions.

When the sub base material consists of combination of materials mentioned in clause 401.2, mixing shall be done mechanically by the mix in- place method.

Manual mixing shall be permitted only where the width of laying is not adequate for mechanical operations, as in small – sized jobs. The equipment used for mix-in-place construction shall be rotavator or similar approved equipment capable of mixing the material to the desired degree. If so desired by the Engineer, trial runs with the equipment shall be carried out to establish its suitability for the work.

Moisture content of the loose material shall be checked in accordance with IS: 2720 (part 2) and suitably adjusted by sprinkling additional water from a truck mounted or trailer mounted water tank and suitable for applying water uniformly and at controlled quantities to variable widths of surface or other means approved by the Engineer so that, at the time of compaction, it is from 1 percent above to 2 percent below the optimum moisture content corresponding to IS: 2720 (part 8). While adding water, due allowance shall be made for evaporation losses. After water has been added, the material shall be processed by mechanical or other approved means like disc harrows, rotavators until the layer is uniformly wet.

Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material determined as per IS: 2720 (part 8). The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks or loose material.

All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re – compacted.

## 5.7 Wet mix Macadam Course (WMM)

The GSB layer surface over which Wet mix Macadam (WMM) is to be laid shall be prepared to the specified grade and camber and made free of dust and other extraneous material.

Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm. WMM. sub-base course of specified thickness shall be provided. The course aggregate for this shall conform to requirements in Table-3.7: Grading Requirements of Coarse Aggregates for Wet Mix Macadam (WMM) (As per Table 400-13 of MORTH Specifications).

**Table – 3.7: Grading Requirements of Coarse Aggregates for Wet Mix Macadam (WMM)**
**(As per Table 400-13 of MORTH Specifications)**

| IS Sieve Designation | Percent by weight passing the IS sieve |
|---|---|
| 53.00 mm | 100 |
| 45.00 mm | 95 – 100 |
| 26.50 mm | - |
| 22.40 mm | 60-80 |
| 11.20 mm | 40-60 |
| 4.75 mm | 25-40 |
| 2.36 mm | 15-30 |
| 600.00 micron | 8-22 |
| 75.00 micron | 0-5 |

**5.7.1**

**5.7.2 Preparation of WMM layer**

Preparation of mix: Wet Mix Macadam shall be prepared in an approved mixing plant of suitable capacity having provision for controlled addition of water and forced/positive mixing arrangement like pugmill or pan type mixer of concrete batching plant. For small quantity of wet mix work, the Engineer may permit the mixing to be done in concrete mixers.

Optimum moisture for mixing shall be determined in accordance with IS: 2720 (Part-8) after replacing the aggregate fraction retained on 22.4 mm sieve with material of 4.75 mm to 22.4 mm size. While adding water, due allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mixed material should be uniformly wet and no segregation should be permitted.

Spreading of mix: Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared subgrade /sub- base/base in required quantities. In no case should these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed stretch be permitted.

The mix may be spread either by a paver finisher or motor grader. For portions where mechanical means cannot be used, manual means as approved by the Engineer shall be used so as to achieve the specified slope and grade. The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The layer may be tested by depth blocks

during construction. No segregation of larger and fine particles should be allowed. The aggregates as spread should be of uniform gradation with no pockets of fine materials.

Compaction: After the mix has been laid to the required thickness, grade and crossfall/camber the same shall be uniformly compacted, to the full depth with suitable vibratory roller. The speed of the roller shall not exceed 5 km/h. The work shall be done as per Clause 406 MORTH V revision and as per BOQ provisions.

### 5.8 Primer coat

Primer: The choice of a bituminous primer shall depend upon the porosity characteristics of the surface to be primed as classified in IRC: 16. Surface of low porosity; such as wet mix macadam. The primer shall be bitumen emulsion.

Primer viscosity: The type and viscosity of the primer shall comply with the requirements of IS 8887, as sampled and tested for bituminous primer in accordance with these standards. Guidance on viscosity and rate of spray is given in Table-3.8 & 3.8a: Requirement of Viscosity and quantity of Liquid bituminous Primer (As per Table 500-1 & 500-3 of MORTH Specifications).

**Table-3.8: Selection Criteria for Viscosity-Graded (VG) Paving Bitumens based on Climatic conditions (As per Table 500-1 of MORTH Specifications)**

| **Lowest Daily Mean Air Temperature, ºC** | **Highest Daily Mean Air Temperature, ºC** | | |
|---|---|---|---|
| | Less than 20ºC | 20 to 30 ºC | More than 30ºC |
| More than -10ºC | VG-10 | VG-20 | VG-30 |
| -10ºC or lower | VG-10 | VG-10 | VG-20 |

**Table-3.8a: Quantity of Bitumen Emulsion for various Types of granular Surfaces (As per Table 500-3 of MORTH Specifications)**

| **Type of Surface** | **Rate of Spray(kg/sqm)** |
|---|---|
| WMM/WBM | 0.7-1.0 |
| Stabilized soil bases/Crusher Run Macadam | 0.9-1.2 |

Providing and applying primer coat with S.S. bitumen emulsion on prepared surface of granular base such as WMM including cleaning of road

surface and spraying primer at the rate of 0.70 kg/sqm using mechanical means complete as per specifications The work shall be done as per Clause 502 MORTH V revision and as per BOQ provisions.

Preparation of road surface: The surface to be primed shall be prepared in accordance with Clauses 501.8. and 902 as appropriate. Immediately prior to applying the primer the surface shall be carefully swept clean of dust and loose particles, care being taken not to disturb the interlocked aggregate. This is best achieved when the surface layer is slightly moist (lightly sprayed with water and the surface allowed to dry) and the surface should be kept moist until the primer is applied.

Application of bituminous primer: The viscosity and rate of application of the primer shall be as specified in the Contract, or as determined by site trials carried out as directed by the Engineer. The bituminous primer shall be sprayed uniformly in accordance with Clause 501 of MORTH specifications. The method for application of the primer will depend on the type of equipment to be used, size of nozzles, pressure at the spray bar and speed of forward movement. The Contractor shall demonstrate at a spraying trial, that the equipment and method to be used is capable of producing a uniform spray, within the tolerances specified.

Curing of primer and opening to traffic: A primed surface shall be allowed to cure for at least 24 hours or such other period as is found to be necessary to allow all the volatiles to evaporate before any subsequent surface treatment or mix is laid. Any unabsorbed primer shall first be blotted with an application of sand, using the minimum quantity possible. The work shall be done as per BOQ provisions.

### 5.9 Tack Coat

Over the primed surface, a tack coat should be applied in accordance with Clause 503 of MORTH Specifications.

The binder used for tack coat shall be bitumen emulsion complying with IS 8887 of a type and grade as specified in the Contract or as directed by the Engineer.

The tack coat distributor shall be a self-propelled or towed bitumen pressure sprayer, equipped for spraying the material uniformly at a specified rate. Hand spraying of small areas, inaccessible to the distributor,

or in narrow strips, shall be sprayed with a pressure hand sprayer, or as directed by the Engineer.

The surface on which the tack coat is to be applied shall be clean and free from dust, dirt, and any extraneous material, and be otherwise prepared in accordance with the requirements of Clauses 501.8 and 902 as appropriate. Immediately before the application of the tack coat, the surface shall be swept clean with a mechanical broom, and high pressure air jet, or by other means as directed by the Engineer.

The application of tack coat shall be at the rate specified in the Contract, and shall be applied uniformly. If rate of application of Tack Coat is not specified in the contract then it shall be at the rate specified in Table-3.9: Requirement of Viscosity and quantity of Liquid bituminous Tack Coat (As per Table 500-5 of MORTH Specifications).

**Table-3.9: Requirement of Viscosity and quantity of Liquid bituminous Tack Coat**
**(As per Table 500-5 of MORTH Specifications).**

| Sl No | Type of Surface | Quantity of Liquid bituminous material in Kg per sq.m.area |
|---|---|---|
| i) | Normal bituminous surfaces | 0.20 to 0.30 |
| iii) | Granular surfaces treated with primer | 0.25 to 0.30 |
| iv) | Non bituminous surfaces<br>Cement concrete pavement | 0.30 to 0.35 |

The normal range of spraying temperature for a bituminous emulsion shall be 20°C to 70°C and for a cutback, 50°C to 80°C. The work shall be done as per Clause 503 MORTH V revision and as per BOQ provisions.

### 3.10.1 Preparation of the Base:

The base on which bituminous macadam is to be laid shall be prepared, shaped and compacted to
the required profile in accordance with Clause 501.8 and 902.3 as appropriate, or as directed by
the Engineer.

## 3.10 Bituminous Macadam

The bitumen shall be paving bitumen of Penetration Grade complying with Indian Standard Specifications for “Paving Bitumen” IS: 73.
Aggregate grading and binder content: When tested in accordance with IS: 2386 Part 1 (wet sieving method), the combined aggregate grading for the particular mixture shall fall within the limits shown in Table-3.10: Composition of Bituminous macadam (BM) (As per Table 500-7 of MORTH Specification) for the grading specified in the Contract. The type and quantity of bitumen, and appropriate thickness, are also indicated for each mixture type. The aggregates shall be proportioned and blended to produce a uniform mixture complying with the requirements of Table 500-7.

**Table-3.10: Composition of Bituminous macadam (BM)**
**(As per Table 500-7 of MORTH Specification)**

| Mix designation | Grading 1 | Grading 2 |
|---|---|---|
| Nominal max aggregate size* | 40mm | 19 mm |
| Layer thickness | 80 -100mm | 50 - 75 mm |
| IS Sieve size (mm) | Cumulative % by weight of total aggregate passing | |
| 45 | 100 | |
| 37.5 | 90-100 | |
| 26.5 | 75-100 | 100 |
| 19 | - | 90-100 |
| 13.2 | 35-61 | 56-88 |
| 4.75 | 13-22 | 16-36 |
| 2.36 | 4-19 | 4-19 |
| 0.3 | 2-10 | 2-10 |
| 0.075 | 0-8 | 0-8 |
| Bitumen content,** % by weight of total mix | 3.3** | 3.4** |

*Nominal maximum aggregrate size is the largest specified sieve size upon which any of the aggregrate material is retained.
**Corresponds to specific gravity of the Aggregate being 2.7. In case aggregates have specific gravity more than 2.7 bitumen content can be reduced proportionately. Further, for regions where highest daily mean air temperature is 30°C or lowest and lowest daily mean air temperature is -10°C or lower, the bitumen content may be increased by 0.5 percent.

### 3.10.1 Preparation of the Base:

The base on which bituminous macadam is to be laid shall be prepared, shaped and compacted to
the required profile in accordance with Clause 501.8 and 902.3 as appropriate, or as directed by
the Engineer.

### 3.10.2 Preparation and transportation of the Mixture:

The provisions of Clauses 501.3 and 501.4 shall apply.

**3.10.3 Spreading:** The provisions of Clauses 501.5.3 shall apply.

### 3.10.4 Compaction:

Compaction shall be carried out in accordance with the provisions of Clause 501.6 and 501.7. The details of mixing, laying and rolling temperature of BM mix is as indicated in Table-3.11: Mixing, Laying and Rolling Temperatures for Bituminous Mixes (Degree celcius) (As per Table 500-2 of MORTH Specifications).

Rolling shall be continued until the specified density is achieved, or where no density is specified, until there is no further movement under the roller. The required frequency of testing is defined in Clause 903.

**Table-3.11: Mixing, Laying and Rolling Temperatures for Bituminous Mixes**
**(Degree celsius)**
**(As per Table 500-2 of MORTH Specifications)**

| Bitumen Viscosity grade | Bitumen Temperature (°C) | Aggregate Temperature(°C) | Mixed Material Temperature (°C) | *Rolling Temperature (°C) | Laying Temperature (°C) |
|---|---|---|---|---|---|
| VG-40 | 160-170 | 160-170 | 160-170 | 100 Min | 150 Min |
| VG-30 | 150-165 | 150-170 | 150-165 | 90 Min | 140 Min |
| VG-20 | 145-165 | 145-170 | 145-165 | 85 Min | 135 Min |
| VG-10 | 140-160 | 140-165 | 140-160 | 80 Min | 130 Min |

*Rolling must be completed before the mat cools to these minimum temperatures.

The bituminous macadam shall be covered with either the next pavement course or wearing course, as the case may be, within a maximum of forty-eight hours. If there is to be any delay, the course shall be covered by a seal

coat to the requirement of Clause 513 before opening to any traffic. The seal coat in such cases shall be considered incidental to the work and shall not be paid for separately. The work shall be done as per Clause 504 MORTH V revision and as per BOQ provisions.

### 3.11 Bituminous Concrete

This work shall consist of construction in a single layer of bituminous concrete on a previously prepared Bituminous Macadam (BM) surface. The work shall be done as per Clause 507 MORTH V revision and as per BOQ provisions.

Bitumen: The bitumen shall be paving bitumen of Penetration grade complying with Indian Standard Specification for Paving Bitumen, IS: 73 and of the penetration indicated in Table 500-17, for bituminous concrete. The coarse aggregates shall be generally as specified in Clause 507.2.2, except that the aggregates shall satisfy the physical requirements of Table 500-17.

Requirements for the mixture: Apart from conformity with the grading and quality requirements for individual ingredients, the mixture shall meet the requirements set out in Table-3.12: Composition of Bituminous Concrete (As per Table 500-17 of MORTH Specifications) and Table-3.13: Requirement of Bituminous Concrete (As per Table 500-11: of MORTH Specifications).

Table-3.12: Composition of Bituminous Concrete (As per Table 500-17 of MORTH Specifications)

| | | |
|---|---|---|
| **6 Grading** | 1 | 2 |
| **7 Nominal aggregate size*** | 19 mm | 13.2 mm |
| **8 Layer Thickness** | 50 mm | 30-40 mm |
| 9 **IS Sieve[1] (mm)** | Cumulative % by weight of total aggregate passing | |
| **10 45** | | |
| **11 37.5** | | |
| **12 26.5** | 100 | |

| | | |
|---|---|---|
| **13 19** | 90-100 | 100 |
| **14 13.2** | 59-79 | 90-100 |
| **15 9.5** | 52-72 | 70-88 |
| **16 4.75** | 35-55 | 53-71 |
| **17 2.36** | 28-44 | 42-58 |
| **18 1.18** | 20-34 | 34-48 |
| **19 0.6** | 15-27 | 26-38 |
| **20 0.3** | 10-20 | 18-28 |
| **21 0.15** | 5-13 | 12-20 |
| **22 0.075** | 2-8 | 4-10 |
| **23 Bitumen content % by mass of total mix** | Min 5.2* | Min 5.4** |

*The nominal maximum particle size is the largest specified sieve size upon which any of the aggregrate material is retained.

**Corresponds to specific gravity of the Aggregate being 2.7. In case aggregates have specific gravity more than 2.7 the minimum bitumen content can be reduced proportionately. Further, for regions where highest daily mean air temperature is 30°C or lowest and lowest daily mean air temperature is - 10°C or lower, the bitumen content may be increased by 0.5 percent.

**Table-3.13: Requirement of Bituminous Concrete**
**(As per Table 500-11: of MORTH Specifications)**

| **Properties** | **Viscosity Grade Paving Bitumen** | **Modified Bitumen** | | **Test Method** |
|---|---|---|---|---|
| | | **Hot climate** | **Cold climate** | |

| | | | | |
|---|---|---|---|---|
| Compaction level | 75 blows on each face of specimen | | | |
| Minimum stability (kN at 60 °C) | 9.0 | 12.0 | 10.0 | AASHTO T245 |
| Marshall flow (mm) | 2-4 | 2.5-4 | 3.5-5 | AASHTO T245 |
| Marshall Quotient (Stability/Flow) | 2-5 | 2.5-5 | | MS-2 and ASTM D2041 |
| % Air voids | 3-5 | | | |
| % Voids Filled with Bitumen (VFB) | 65-75 | | | |
| Coating of aggregate particle | 95% minimum | | | IS: 6241 |
| Tensile strength ratio | 80% minimum | | | AASHTO T283 |
| % Voids in Mineral Aggregate (VMA) | Minimum percent voids in mineral aggregate (VMA) are set out in Table 500-12 of MORTH | | | |

**Rolling**

Immediately after the spreading of mix it shall be thoroughly compacted by rolling with vibratory rollers moving at a speed not more than 5 km per hour. Rolling shall be continued till the mix is thoroughly compacted to meet the general provisions of clauses 501.6 and 501.7.

### 23.1.1 Opening to Traffic

Traffic shall be allowed on the road after a lapse of minimum 24 hours, preferably 48 hours after laying as approved by the Employer's Representative.

## 23.2 Quality Control of Road restoration works

### 23.2.1 General

For ensuring the requisite quality of construction, the materials and works shall be subjected to quality control tests, as described hereinafter. The testing frequencies set forth are the desirable minimum and the Engineer shall have the full authority to increase the frequencies of tests as he may deem necessary to satisfy himself that the materials and works comply with the appropriate Specifications.

Test procedures for the various quality control tests are indicated in the respective Sections of these Specifications or for certain tests within this Section. Where no specific testing procedure is mentioned, the tests shall be carried out as per the prevalent accepted engineering practice to the approval of the Engineer.

**23.2.2** Tests on Earthwork for Embankment and Subgrade Construction

(i) Sand content [IS:2720 (Part IV)]

1-2 tests per 8000 cu. metres of soil or as per MORTH.

**(ii) Plasticity Test [IS:2720 (Part V)]**

Each type to be tested, 1-2 tests per 8000 cu. metres of soil or as per MORTH.

**(iii) Density Test [[IS:2720 (Part VII)].**

Each soil type to be tested, 1-2 tests per 8000 cubic metres of soil or as per MORTH.

**(iv) Deleterious Content Test [IS:2720 (PartXXVII)]**

As and when required by the Engineer.

**(v) Moisture Content Test [IS:2720(Part II)]**

One test for every 250 cubic metres of soil or as per MORTH.

**(vi) CBR Test on materials to be incorporated in the subgrade on soaked/unsoaked samples [IS:2720 (part XVI)]**

One test for every 3000 $m^3$ at least or closer as and when required by the Engineer or as per MORTH.

### 23.2.3 Compaction control:

23.2.3.a.1 Control shall be exercised by taking at least one measurement of density for each 500 square metres of compacted area, or closer as required to yield the minimum number of test results for evaluation a days work on statistical basis. The determination of density shall be in accordance with IS:2720 (part XXVIII). Tests locations shall be chosen only

through random sampling techniques. Control shall not be based on the result of any one test but on the mean value of a set of 5-10 density determinations. The number of tests in one set of measurements shall be 5 as long as it is felt that sufficient control over borrow material and the method of compaction is being exercised. If considerable variations are observed between individual density results, the minimum number of tests in one set of measurement shall be increased to 10. The acceptance of work shall be subject to the condition that the mean dry density equals or exceeds the specified density and the standard deviation for any set of results is below 0.08 gm/cc.

However, for earthwork in subgrade and in top 500 mm portion of the embankment below the subgrade, at least one density measurement shall be taken for every 100 square metres of the compacted area provided further `that the number of tests in each set of measurements shall be at least 10. In other respects, the control shall be similar to that described earlier.

### 23.2.4 Tests on Granular Sub base (GSB) and Wet mix macadam (WMM) layers

The tests and their frequencies for the different types of bases and sub-base shall be as given in Table 3.14.

**Table –3.14: Control Tests and their frequencies for Granular Sub base(GSB) and Wet mix macadam (WMM) layers**

| Sl.No. | Types of Construction | Test | Frequency*** |
|---|---|---|---|
| 1. | Granular sub-base | i) Gradation<br>ii) Atterbergs limit<br>iii) Moisture content prior to compaction<br>iv) Density of compacted layer<br>v) Deleterious constituents<br>vi) C.B.R | One test per 200 $m^3$<br>One test per 200 $m^3$<br>One test per 250 $m^2$<br>One test per 500 $m^2$<br>As required<br>As required |
| 2. | Lime/Cement Stabilised | i) Purity of lime (for lime-soil stabilization | One test for each consignment |

| Sl.No. | Types of Construction | Test | Frequency*** |
|---|---|---|---|
| | | ii) Lime/Cement content<br>iii) Degree of pulverisation<br>iv) CBR test on a set of 3 specimens<br>v) Moisture content prior to compaction<br>vi) Density of compacted layer<br>vii) Deleterious constituents | subject to a minimum of one test per 5 tonnes of lime.<br>Regularly, through procedural checks.<br>Periodically as considered necessary.<br>As required<br>One test per 250 $m^3$.<br>One test per 500 $m^2$<br>As required |
| 3 | Wet mix Macadam | i) Aggregate Impact Value<br>ii) Grading<br>iii) Flakiness Index<br>iv) Atterberg limits of portion of aggregate passing 425 micron sieve | One test per 200$m^3$ of aggregate<br>One test per 100 $m^3$ of aggregate<br>One test per 200 $m^3$ of aggregate<br>One test per 100 $m^3$ |

***** Or as per MORTH**

### 23.2.5 Tests on Bituminous Constructions

The tests and their frequencies for the different types of bituminous works shall be as given inTable - 3.15 hereunder.

**Table – 3.15: Control Tests and their Frequency for Bituminous Works**

| Sl. No. | Types of Construction | Test | Frequency |
|---|---|---|---|
| 1. | Prime Coat/Tack Coat | i) Quality of binder<br>ii) Binder temperature for a application<br>iii) Rate of spread of binder | As Required<br>At regular close intervals<br><br>Two tests per day |
| 2 | Bituminous macadam (BM) / Bituminous Concrete ( BC) | i) Quality of binder<br>ii) Aggregate impact value, flakiness index and stripping value of aggregates<br><br>iii) Mix-grading<br><br>iv) Control of temperature of binder in boiler, aggregate in the dryer and mix at the time of laying and rolling<br><br>v) Stability of mix (vide ASTM:D-1559)<br><br>vi) Binder content and gradation in the mix (Binder content test vide ASTM:D-2172)<br><br>vii) Rate of spread of mixed material | As required<br>One test per 50-100$m^3$ of aggregate<br><br>One set of test on individual constituents and mixed aggregates from the dryer for each 100 tonnes of mix subject to a maximum of two sets per plant per day.<br><br>At regular close interval.<br><br>For each 100 tonnes of mix produced, a set of three Marshall specimens to be prepared and tested for stability, flow value density, and void content, subject to a minimum of two sets being tested per plant per day.<br>One test for each 100 tonnes of mix subject to a minimum of two tests |

| Sl. No. | Types of Construction | Test | Frequency |
|---|---|---|---|
| | | | per day per plant. |
| | | viii) Density of compacted layer | Regular control through checks on the weight of mixed material and layer thickness.<br><br>One test per 250 $m^2$ area |

### 23.3 Pipe Drains

Wherever required, pipe drains shall be provided for cross drainage purposes. The sequence of construction shall be as follows:

(a) laying of sand/shingle bedding on the original ground,
(b) laying of PCC of M10 grade,
(c) laying of concrete pipes of NP4 class as per IS 458,
(d) Constructing embankment above in compacted murum, laying of the sub-base and
Wet mix Macadam as specified herein above.
The details of above works as directed by Engineer shall be followed.

#### 23.3.1 Materials for Pipe Drains

All materials used in the construction of pipe drains shall conform to the requirements of the Specifications. RCC pipes of NP4 class shall conform to IS 458.

Each consignment of cement concrete pipes shall be inspected, tested if necessary, and approved by Engineer at the place of manufacture or at site before their incorporation in the Works.

#### 23.3.2 Excavation for pipes

The foundation bed for pipe drain shall be executed true to the lines and grades shown on the drawings or as directed by the Engineer. The pipes shall be placed in shallow excavation of the natural ground in open trenches

cut in the existing embankment, taken down to levels as shown in the drawings. Where trenching is involved, its width on either side of pipe shall not be less than 200 mm nor more than one third the diameter of pipe. The sides of the trench shall be as nearly vertical as possible.

When during excavation, the material encountered is soft, spongy or other unstable soil, unless other special construction methods are called for as indicated on drawings, such unsuitable material shall be removed upto a depth of 600 mm or as directed by the Engineer. Before placing any backfill material, exposed surface of the soft soil shall be lightly compacted with one pass of 0.5 T roller. On the lightly compacted surface, coarse sand and shingle shall be spread in two successive layers of 300 mm and each layer shall be compacted by rolling with a min.0.5 T roller and with a minimum of 10 passes each, both in longitudinal and transverse directions.

When bed rock or boulder strata are encountered, excavation shall be taken down at least 300 mm below bottom level of pipe as directed by Engineer and space filled with approved sand and shingle and thoroughly compacted to provide adequate support for the pipes.

Trenches shall be kept free from water until the pipes are installed and the joints have been hardened. For this purpose, Contractor shall suggest necessary method for diverting the water.

### 23.3.3 Bedding for pipe

The bedding surface shall provide a firm foundation of uniform density throughout the length of the pipe drain and shall conform to the specified level and grade.

The pipe shall be bedded in a cradle of concrete having a mix not leaner than M-10. The pipes shall be laid on the concrete bedding before the concrete has set.

### 23.3.4 Laying of pipes

No pipe shall be placed in position until the foundations have been approved by Engineer. When pipes are to be laid adjacent to each other, they shall be separated by a distance atleast equal to or greater than half the diameter of pipe subject to a minimum of 450 mm.
The laying of pipes on the prepared concrete foundation shall start from the outlet and proceed towards the inlet and be completed to the specified lines

and grades. The pipes shall be fitted and matched so that when laid they form a drain with a smooth uniform invert.
Any pipe found defective or damaged during laying shall be removed at the cost of the Contractor.

### 23.3.5 Jointing

All the joints shall be made with care so that their interior face is smooth and consistent with the interior surface of the pipes. The ends of the pipes should be so shaped as to form a self-centering joint with jointing space 13 mm wide. The jointing space shall be filled with cement mortar (1 cement to 2 sand) mixed sufficiently dry to remain in position when forced with a trowel or rammer. Care shall be taken to fill all voids and excess mortar shall be removed. After finishing, the joints shall be kept covered and damp for at least four days.

### 23.3.6 Back filling

Trenches shall be backfilled with selected murum as per specifications given in this part. Backfilling upto 0.3 metre above the top of pipe shall be carefully done and murum shall be thoroughly consolidated under the haunches of the pipe.

## 23.4 Coursed Rubble Masonry

### 23.4.1 Materials

Stones for the works shall be of the specified variety which is hard, durable, fine grained and uniform in colour (for superstructure work) free from veins, flaws and other defects. Quality and work shall conform to the requirements specified in IS:1597 (Part-I). The percentage of water absorption shall not exceed 5 percent as per test conducted in accordance with IS: 1124. The Contractor shall supply sample stones to the Engineer for approval. Stones shall be laid with its grains horizontal so that the load transmitted is always perpendicular to the natural bed.

### 23.4.2 Workmanship

All courses shall be laid truly horizontal and shall be of the same height in any course. The height of course shall not be less than 150 mm and not more than 300 mm. The width of stone shall not be less than its height.

Face stones shall tail into the work for not less than their height and at least 1/3rd the number of stones shall tail into the work for a length not less than twice their height but not more than three-fourths the thickness of the wall whichever is smaller. These should be laid as headers and stretchers alternately to break joints by at least 75 mm.

The face stones shall be squared on all joints and beds; the bed joints being hammer or chisel dressed true and square for at least 80 mm back from the face and the side joints for at least 40 mm. The face of the stone shall be hammer dressed so that the bushing shall not be more than 40 mm on an exposed face and 10 mm on a face to be plastered. No portion of the dressed surface shall show a depth of gap more than 6 mm from a straight edge placed on it. The remaining unexposed portion of the stone shall not project beyond the surface of bed and side joints.

No spalls or pinnings shall be allowed on the face. All bed joints shall be horizontal and side joints shall be vertical and no joints shall be more than 10 mm in thickness. When plastering or pointing is not required to be done, the joints shall be struck flush and finished as the work proceeds. Otherwise, the joints shall be raked to a minimum depth of 20 mm by a raking tool, during the progress of the work while the mortar is still green.

Hearting shall consist of flat bedded stones carefully laid on their proper beds and solidly bedded in mortar. The use of chips shall be restricted to the filling of interstices between the adjacent stones in hearting and these shall not exceed 10 percent of the quantity of the stone masonry. Care shall be taken so that no hollow spaces are left anywhere in the masonry.

The through or bond stones shall be provided at 1.5 m to 1.8m apart clear in every course but staggered at alternate courses.

The quoins which shall be of the same height as the course in which they occur, shall not be less than 450 mm in any direction. Quoin stones shall be laid as stretchers and headers alternately. They shall be laid square on their beds, which shall be rough chisel dressed to a depth of at least 100 mm from the face. These stones shall have minimum uniform chisel drafts of 25mm width at four edges, all the edges being in the same plane.

**23.4.3 Measurement**

Measurement shall be in cum correct to two places of decimal. The quantities measured and paid for, shall be those as actually executed after making necessary deductions for openings.

**End of Part 3**

## SECTION 8:

## DRAWINGS

**(Attached)**

## SECTION 9:

## BILL OF QUANTITIES

Note:

(1) Item for which no rate or price has been entered in will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities (refer: ITB Clause 11.2 and CC Clause 37.2).

(2) Unit rates and prices shall be quoted by the Tenderer in Indian Rupees and it is Excluding GST.

(3) Where there is a discrepancy between the rate in figures and words, the lower of the two will govern. [ITT Clause 24.1(a)]

(4) Where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by quantity, the unit rate quoted shall govern [ITT Clause 24.1 (b)]

## SECTION 10:

## FORMAT OF BANK GUARANTEE FOR SECURITY DEPOSIT

To: _____ [name of Employer]
_____ [address of Employer]
WHEREAS _____ [name and address of Contractor] (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. _____ dated _____ to execute _____ [name of Contract and brief description of Works] (hereinafter called "the Contract");
AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;
AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;
NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of Rs._____ [amount of guarantee] [63]_Rupees_____ _____[in words], and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of _____ [amount of guarantee][64] as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.
We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.
We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.
This guarantee shall be valid until 30 days from the date of expiry of the Defects Liability Period.
Signature and seal of the guarantor _____
Name of Bank _____
Address _____
Date _____

[63] An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract

[64] An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract